BreezeMAX™ FDD Base Station

Installation & Maintenance Manual

February 2008
P/N 214834
Rev.C

Document History

Topic	Description	Revision/Date Issued
This is the manual's first release, supporting the BreezeMAX FDD Base Station only.		Rev. A, November 2005
Micro Base Station	Added	Rev. B, June 2006
AU-ODU-HP	New HW	Rev. B, June 2006
Power Feeder	New HW	Rev. B, June 2006
ODU Tx Power Range Section 1.5.1	Updated	Rev. B, July 2007
Single Device Manager Section 1.4.2	Updated	Rev. B, July 2007
Guidelines for Positioning the AU-ODU Section 3.1	Added information	Rev. B, July 2007
"H" Installation Accessory Appendix C	New optional accessory for installation of multiple AU-ODUs and antennas serving the same sector	Rev. B, July 2007
High Power PIU Sections 1.1.2, 1.5.2.1, 1.5.2.2	Added new PIU type	Rev. C, February 2008
Distance between antennas serving the same sector Section 3.1	Updated	Rev. C, February 2008

Legal Rights

The material contained herein is proprietary, privileged, and confidential and owned by Alvarion or its third party licensors. No disclosure thereof shall be made to third parties without the express written permission of Alvarion Ltd.

Alvarion Ltd. reserves the right to alter the equipment specifications and descriptions in this publication without prior notice. No part of this publication shall be deemed to be part of any contract or warranty unless specifically incorporated by reference into such contract or warranty.

Trade Names

Alvarion®, BreezeCOM®, WALKair®, WALKnet®, BreezeNET®, BreezeACCESS®, BreezeMANAGE™, BreezeLINK®, BreezeConfig™, BreezeMAX™, AlvariSTAR™, AlvariCRAFT™, BreezeLITE™, MGW™, eMGW™, and/or other products and/or services referenced here in are either registered trademarks, trademarks or service marks of Alvarion Ltd.

All other names are or may be the trademarks of their respective owners.

Statement of Conditions

The information contained in this manual is subject to change without notice. Alvarion Ltd. shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this manual or equipment supplied with it.

Warranties and Disclaimers

All Alvarion Ltd. ("Alvarion") products purchased from Alvarion or through any of Alvarion's authorized resellers are subject to the following warranty and product liability terms and conditions.

Exclusive Warranty

(a) Alvarion warrants that the Product hardware it supplies and the tangible media on which any software is installed, under normal use and conditions, will be free from significant defects in materials and workmanship for a period of fourteen (14) months from the date of shipment of a given Product to Purchaser (the "Warranty Period"). Alvarion will, at its sole option and as Purchaser's sole remedy, repair or replace any defective Product in accordance with Alvarion' standard R&R procedure.

(b) With respect to the Firmware, Alvarion warrants the correct functionality according to the attached documentation, for a period of fourteen (14) month from

invoice date (the "Warranty Period")". During the Warranty Period, Alvarion may release to its Customers firmware updates, which include additional performance improvements and/or bug fixes, upon availability (the "Warranty"). Bug fixes, temporary patches and/or workarounds may be supplied as Firmware updates.

Additional hardware, if required, to install or use Firmware updates must be purchased by the Customer. Alvarion will be obligated to support solely the two (2) most recent Software major releases.

ALVARION SHALL NOT BE LIABLE UNDER THIS WARRANTY IF ITS TESTING AND EXAMINATION DISCLOSE THAT THE ALLEGED DEFECT IN THE PRODUCT DOES NOT EXIST OR WAS CAUSED BY PURCHASER'S OR ANY THIRD PERSON'S MISUSE, NEGLIGENCE, IMPROPER INSTALLATION OR IMPROPER TESTING, UNAUTHORIZED ATTEMPTS TO REPAIR, OR ANY OTHER CAUSE BEYOND THE RANGE OF THE INTENDED USE, OR BY ACCIDENT, FIRE, LIGHTNING OR OTHER HAZARD.

Disclaimer

(a) The Software is sold on an "AS IS" basis. Alvarion, its affiliates or its licensors MAKE NO WARRANTIES, WHATSOEVER, WHETHER EXPRESS OR IMPLIED, WITH RESPECT TO THE SOFTWARE AND THE ACCOMPANYING DOCUMENTATION. ALVARION SPECIFICALLY DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT WITH RESPECT TO THE SOFTWARE. UNITS OF PRODUCT (INCLUDING ALL THE SOFTWARE) DELIVERED TO PURCHASER HEREUNDER ARE NOT FAULT TOLERANT AND ARE NOT DESIGNED, MANUFACTURED OR INTENDED FOR USE OR RESALE IN APPLICATIONS WHERE THE FAILURE, MALFUNCTION OR INACCURACY OF PRODUCTS CARRIES A RISK OF DEATH OR BODILY INJURY OR SEVERE PHYSICAL OR ENVIRONMENTAL DAMAGE ("HIGH RISK ACTIVITIES"). HIGH RISK ACTIVITIES MAY INCLUDE, BUT ARE NOT LIMITED TO, USE AS PART OF ON-LINE CONTROL SYSTEMS IN HAZARDOUS ENVIRONMENTS REQUIRING FAIL-SAFE PERFORMANCE, SUCH AS IN THE OPERATION OF NUCLEAR FACILITIES, AIRCRAFT NAVIGATION OR COMMUNICATION SYSTEMS, AIR TRAFFIC CONTROL, LIFE SUPPORT MACHINES, WEAPONS SYSTEMS OR OTHER APPLICATIONS REPRESENTING A SIMILAR DEGREE OF POTENTIAL HAZARD. ALVARION SPECIFICALLY DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR HIGH RISK ACTIVITIES.

(b) PURCHASER'S SOLE REMEDY FOR BREACH OF THE EXPRESS WARRANTIES ABOVE SHALL BE REPLACEMENT OR REFUND OF THE PURCHASE PRICE AS SPECIFIED ABOVE, AT ALVARION'S OPTION. TO THE FULLEST EXTENT ALLOWED BY LAW, THE WARRANTIES AND REMEDIES SET FORTH IN THIS AGREEMENT ARE EXCLUSIVE AND IN LIEU OF ALL OTHER

WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING BUT NOT LIMITED TO WARRANTIES, TERMS OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, SATISFACTORY QUALITY, CORRESPONDENCE WITH DESCRIPTION, NON-INFRINGEMENT, AND ACCURACY OF INFORMATION GENERATED. ALL OF WHICH ARE EXPRESSLY DISCLAIMED. ALVARION' WARRANTIES HEREIN RUN ONLY TO PURCHASER, AND ARE NOT EXTENDED TO ANY THIRD PARTIES. ALVARION NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE OR USE OF ITS PRODUCTS.

Limitation of Liability

(a) ALVARION SHALL NOT BE LIABLE TO THE PURCHASER OR TO ANY THIRD PARTY, FOR ANY LOSS OF PROFITS, LOSS OF USE, INTERRUPTION OF BUSINESS OR FOR ANY INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES OF ANY KIND, WHETHER ARISING UNDER BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE AND WHETHER BASED ON THIS AGREEMENT OR OTHERWISE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

(b) TO THE EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL THE LIABILITY FOR DAMAGES HEREUNDER OF ALVARION OR ITS EMPLOYEES OR AGENTS EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCT BY PURCHASER, NOR SHALL THE AGGREGATE LIABILITY FOR DAMAGES TO ALL PARTIES REGARDING ANY PRODUCT EXCEED THE PURCHASE PRICE PAID FOR THAT PRODUCT BY THAT PARTY (EXCEPT IN THE CASE OF A BREACH OF A PARTY'S CONFIDENTIALITY OBLIGATIONS).

Disposal of Electronic and Electrical Waste

Disposal of Electronic and Electrical Waste

Pursuant to the WEEE EU Directive electronic and electrical waste must not be disposed of with unsorted waste. Please contact your local recycling authority for disposal of this product.

Important Notice

This user manual is delivered subject to the following conditions and restrictions:

- This manual contains proprietary information belonging to Alvarion Ltd. Such information is supplied solely for the purpose of assisting properly authorized users of the respective Alvarion products.
- No part of its contents may be used for any other purpose, disclosed to any person or firm or reproduced by any means, electronic and mechanical, without the express prior written permission of Alvarion Ltd.
- The text and graphics are for the purpose of illustration and reference only. The specifications on which they are based are subject to change without notice.
- The software described in this document is furnished under a license. The software may be used or copied only in accordance with the terms of that license.
- Information in this document is subject to change without notice. Corporate and individual names and data used in examples herein are fictitious unless otherwise noted.
- Alvarion Ltd. reserves the right to alter the equipment specifications and descriptions in this publication without prior notice. No part of this publication shall be deemed to be part of any contract or warranty unless specifically incorporated by reference into such contract or warranty.
- The information contained herein is merely descriptive in nature, and does not constitute an offer for the sale of the product described herein.
- Any changes or modifications of equipment, including opening of the equipment not expressly approved by Alvarion Ltd. will void equipment warranty and any repair thereafter shall be charged for. It could also void the user's authority to operate the equipment.

About This Manual

The purpose of this manual is to guide the installing engineer in the installation of the BreezeMAX Base Station and Micro Base Station. The manual provides detailed instructions on installing and maintaining the Base Station and all its components.

The manual comprises the following chapters:

- Chapter 1 - Introduction: Provides an overview of the BreezeMAX Base Station/µBST components and their specifications.
- Chapter 2 - Preparations and Precautions - Provides detailed safety guidelines, ESD precautions and lightning protection.
- Chapter 3 - Planning the installation site - Provides guidelines for preparing the installation site, including guidelines on positioning the ODU, physical and environmental requirements, cooling requirements, and electrical requirements. This chapter also lists the tools and materials required for installation.
- Chapter 4 - Inspecting and Unpacking - Describes the items shipped with the Base Station/µBST, with the ODU and with each module.
- Chapter 5 - Mechanical Installation - Provides step-by-step instructions for installing the Base Station/µBST in a rack, for installing the various modules in the chassis, and for installing the AU-ODU on a pole or tower.
- Chapter 6 - Connecting the Cables - Describes how to connect the antenna cable, the IF Cable and the grounding cable, and how to seal the connectors.
- Chapter 7 - Connecting to Power - Describes the recommended procedure for connecting the Base Station/µBST to the power in order to avoid damage to the modules.
- Chapter 8 - Connecting to the Network and NMS - Describes how to connect the Base Station/µBST to the network and to the Network Management System.

- Chapter 9 - Power Up Procedure - Describes the operational tests required after installation, in order to check that the Base Station/µBST is in working condition, and that all local wiring is correct and intact.

- Chapter 10 - Commissioning Procedure - Describes the basic configuration required to enable remote management of the Base Station/µBST. The chapter also describes the upgrade procedure.

- Chapter 11 - Maintenance - Provides instructions for AU-ODU, antenna, and for the Base Station/µBST maintenance.

- Chapter 12 - Troubleshooting.

- Appendix A - Installation Checklist - Provides a recommended checklist for the entire installation and commissioning process.

- Appendix B - Installation Report - Provides a recommended report format to be filled out by the installer.

- Glossary - Provides a listing of common terms/acronyms and their explanation.

Contents

Chapter 1 - Introduction

Chapter 4 - Inspecting and Unpacking

Chapter 5 - Mechanical Installation

Chapter 6 - Connecting the Cables

1

Chapter 1 - Introduction

In This Chapter:

1.1 General

BreezeMAX FDD (BreezeMAX) is the WiMAX-ready platform operating in Frequency Division Duplex (FDD) mode, for the licensed 3 - 4 GHz frequency bands.

Built from the ground up based on the IEEE 802.16/ETSI HIPERMAN standards, BreezeMAX is designed specifically to meet the unique requirements of the wireless Metropolitan Area Network (MAN) environment and to deliver broadband access services to a wide range of customers, including residential, SOHO, SME and multi-tenant customers. Its Media Access Control (MAC) protocol was designed for point-to-multipoint broadband wireless access applications, providing a very efficient use of the wireless spectrum and supporting difficult user environments. The access and bandwidth allocation mechanisms accommodate hundreds of subscriber units per channel, with subscriber units that may support different services to multiple end users.

The system uses OFDM radio technology, which is robust in adverse channel conditions and enables operation in non line of sight links. This allows easy installation and improves coverage, while maintaining a high level of spectral efficiency. Modulation and coding can be adapted per burst, ever striving to achieve a balance between robustness and efficiency in accordance with prevailing link conditions.

BreezeMAX products are currently available in the 3.3 - 3.6 GHz frequency band. The actual operating frequencies used by the system can be configured according to applicable radio regulations, license conditions and specific deployment considerations.

A BreezeMAX system comprises the following:

- **Customer Premise Equipment (CPE)**: BreezeMAX Subscriber Units and Alvarion's Voice/Networking Gateways. The CPE is not covered in this manual.
- **Base Station (BST) Equipment**: BreezeMAX Base Station equipment, including the modular Base Station and its components and the stand-alone Micro Base Station (µBST).
- **Networking Equipment**: Standard switches/routers and other networking equipment, supporting connections to the backbone and/or Internet.
- **Management Systems**: SNMP-based Management, Billing and Customer Care, and other Operation Support Systems.

1.1.1 System Architecture

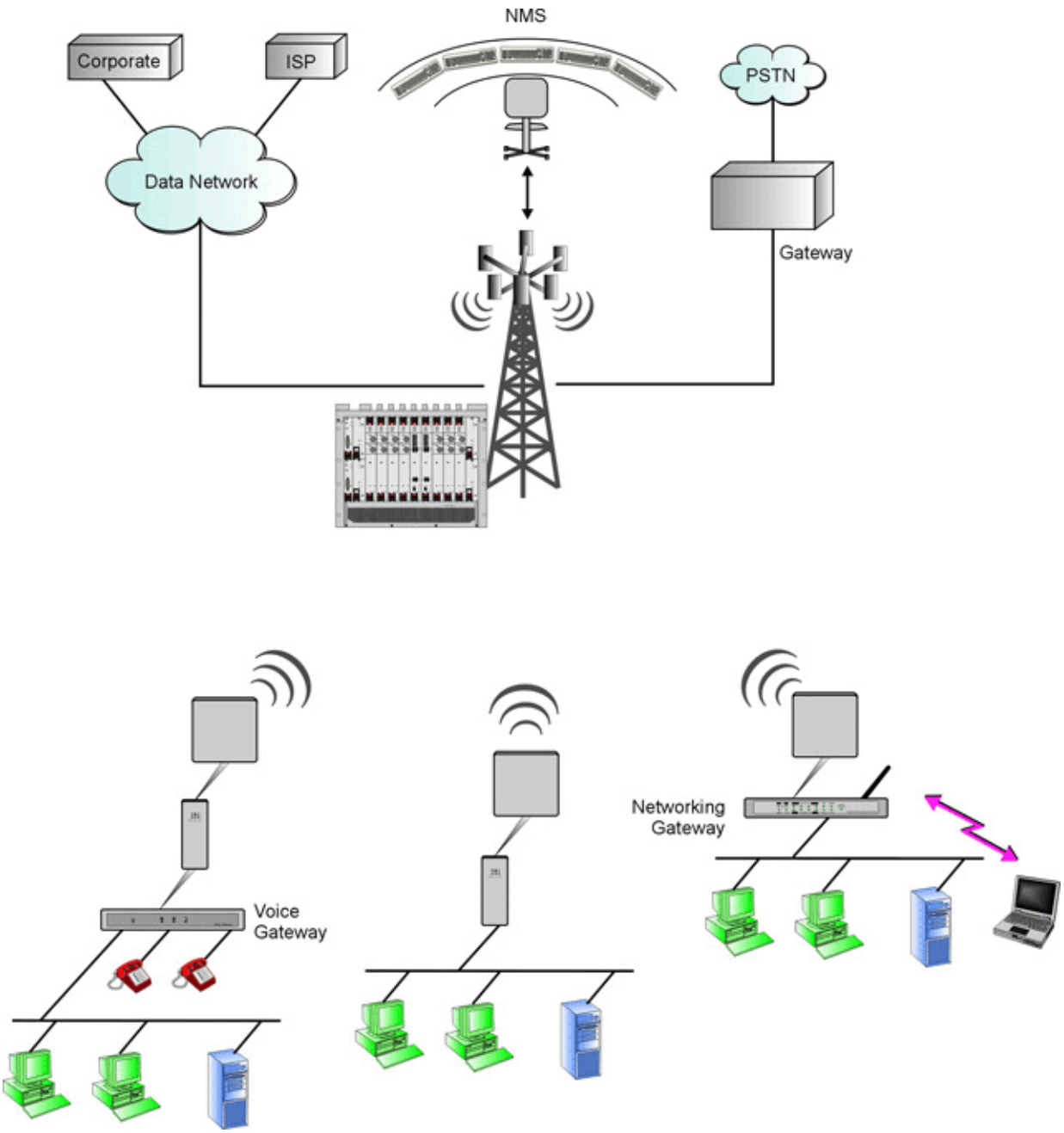


Figure 1-1: System Architecture - with Modular Base Station

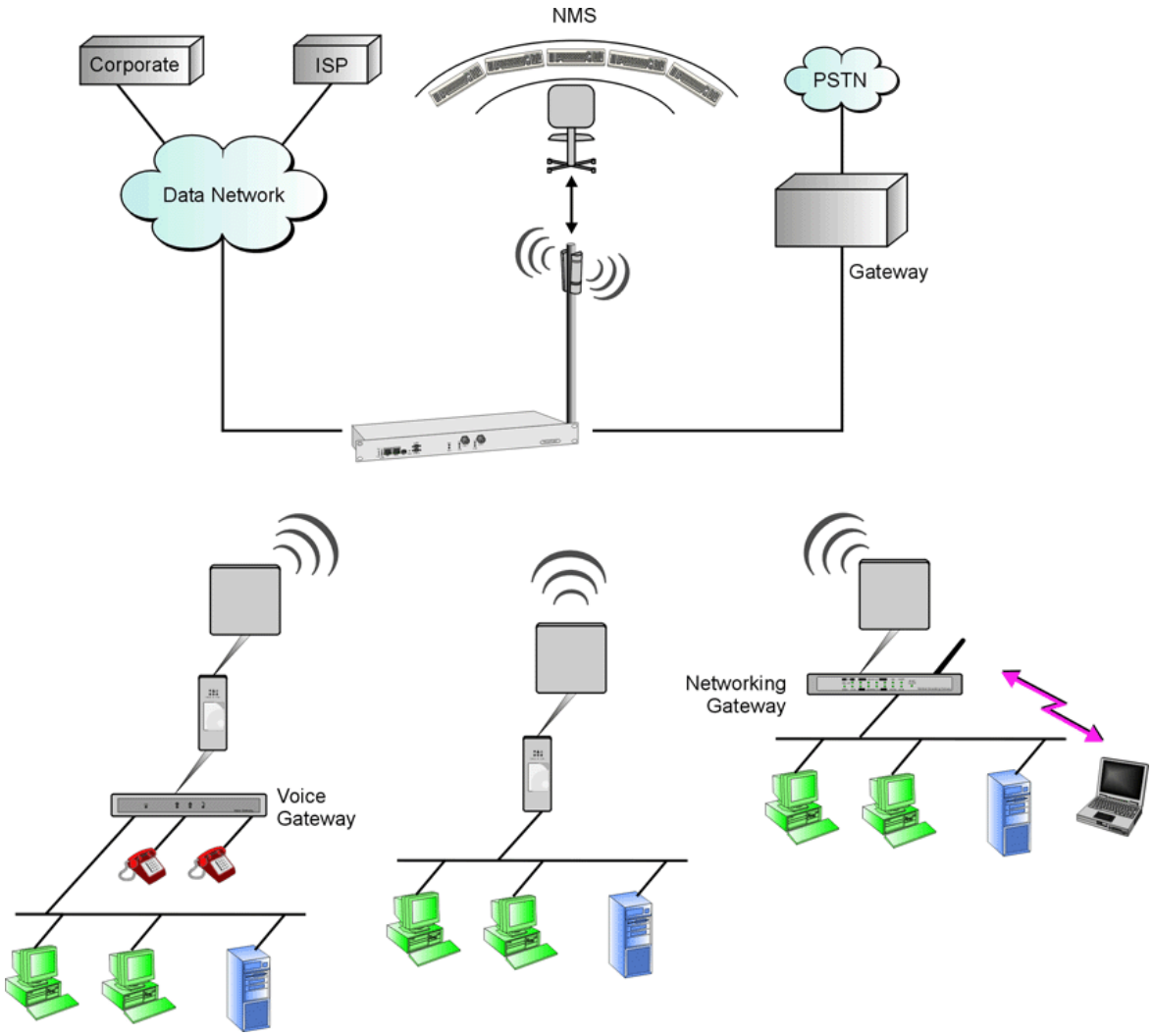


Figure 1-2: System Architecture - with Micro Base Station

1.1.2 Modular Base Station Basic Modules

The BreezeMAX Base Station Equipment includes a modular Base Station that can serve up to six sectors. The Multi Carrier, High Power, Full Duplex Base Station provides all the functionality necessary to communicate with SUs and to connect to the backbone of the Service Provider.

The modular Base Station comprises the following elements:

- Base Station Chassis - The Base Station Equipment is based on an 8U high compact Peripheral Component Interconnect (cPCI) shelf designed for installation in a 19" or 21" (ETSI) rack. This chassis has a total of nine double Euro (6U high) slots and six single Euro (3U high) slots. All the modules are

hot swappable, and high availability can be provided through multiple redundancy schemes.

- Network Processing Unit (NPU) - The Network Processing Unit is the "heart" of the BreezeMAX Base Station. The NPU module serves as the central processing unit that manages the Base Station's components and the SUs served by it. It also aggregates the traffic from the AU modules and transfers it to the IP Backbone through a dedicated Gigabit/Fast Ethernet interface.

Figure 1-3: NPU

- Access Unit (AU) - The AU comprises an Indoor Unit (IDU) and an Outdoor Unit (ODU). The double Euro AU-IDU module connects to the AU-ODU via an Intermediate Frequency (IF) cable. The IF cable carries full duplex data, control and management signals between the AU-IDU and the AU ODU, as well as power (48 VDC) and 64 MHz synchronization reference clock from the AU-IDU to the AU-ODU. The IF Tx and Rx frequencies are 240 MHz and 140 MHz, respectively. IDU-ODU service channel at 14 MHz serves for bi-directional control, status and management signaling.

Figure 1-4: AU-IDU and AU-ODU

Figure 1-5: AU-IDU-4CH and AU-ODU

Up to 4 AU-ODUs per sector can be installed on an "H" Mounting Bracket for Antennas and ODUs (see Appendix C).

- Power Interface Unit (PIU) - The PIU filters and stabilizes the Base Station input power and protects the system from power problems such as over voltage, surge pulses, reverse polarity connection and short circuits. It also filters high frequency interference (radiated emissions) and low frequency interference (conducted emissions) to the external power source.

  The regular PIU can support a total current of up to 35 A (@40.5 VDC), enabling support of a Base Station with up to 8 High-Power AU-ODUs (4 sectors using second order diversity). For configurations with a higher number of ODUs it is necessary to use Power Feeder(s). The High-Power PIU can support a total current of up to 58 A, enabling support of up to 20 High-Power

AU-ODUs. For configurations with a higher number of ODUs (6 sectors with fourth order diversity) it is necessary to use a Power Feeder.

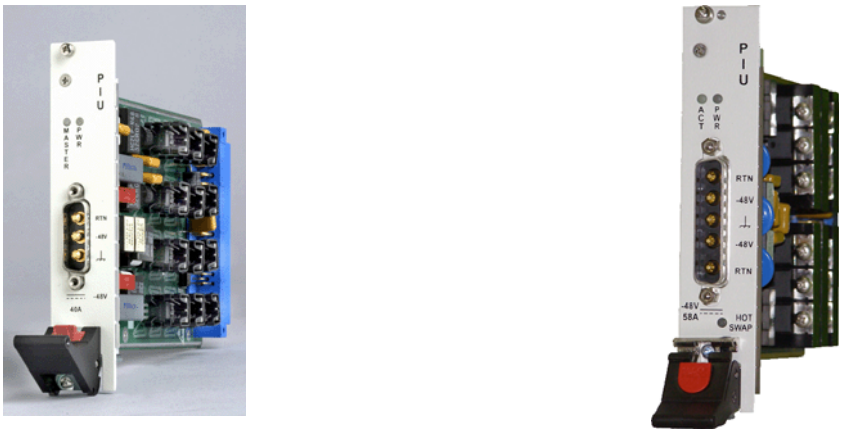


Figure 1-6: PIU (Left) and High-Power PIU (Right)

- Power Supply Unit (PSU) - The PSU is a 48 VDC power supply unit. Each Base Station chassis can contain up to four PSU modules providing N+1 redundancy configurations.

Figure 1-7: PSU

- Air Ventilation Unit (AVU) - The AVU includes an integral chamber for inlet airflow and a fan tray with an internal alarm module. The 2U high, 84 HP wide AVU includes a 1U high integral chamber for inlet airflow and a 1U high fan tray with an internal alarm module. To support a high availability Base Station, the fan tray includes 10 brush-less fans, where 9 fans are sufficient for cooling a fully loaded chassis. To further support high availability, the

chassis can operate with the hot-swappable fan tray extracted from it for a period of time sufficient for replacing it (up to 10 minutes).

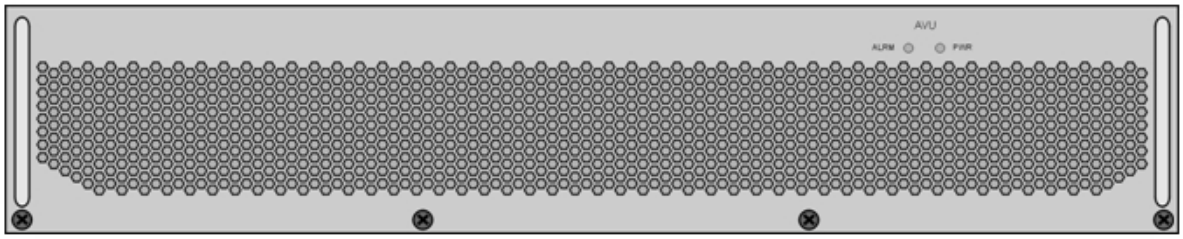


Figure 1-8: AVU Drawer

1.1.3 The Micro Base Station

The Multi Carrier, High Power, Full Duplex Micro Base Station (µBST) provides all the functionality necessary to communicate with SUs and to connect to the backbone of the Service Provider. The Micro Base Station equipment comprises an indoor Micro Base Station Unit and an outdoor radio unit (AU-ODU).

1.1.3.1 The Micro Base Station Indoor Unit

The Micro Base Station unit provides the full base station functionality necessary for serving a single sector. There are two different models: one is powered from the AC mains (110 or 220 VAC), and the other is powered from a -48 VDC power source. The functionality of the Micro Base station is very similar to the combined functionalities of NPU and AU-IDU modules of the modular Base Station.

Figure 1-9: Micro Base Station Unit

The functionality of the Micro Base Station unit includes:

- Backbone Ethernet connectivity via a 10/100 Base-T network interface
- Traffic classification and connection establishment initiation

- Policy based data switching
- Service Level Agreements management
- Centralized agent for managing the Micro Base Station unit and all registered SUs
- Alarms management, including external alarm inputs and activation of external devices (future option).

An SNMP agent incorporated into the unit enables extensive In-Band (IB) management of the Micro Base Station and all its registered SUs. Out-Of-Band (OOB) management is supported through a dedicated 10/100 Base-T interface. A serial RS-232 port supports local configuration, monitoring and debugging.

The Micro Base Station also contains the wireless IEEE 802.16a MAC and modem. It includes two 3.5/1.75 MHz PHY channels that can connect to one or two ODUs.

1.1.3.2 AU-ODU

The AU ODU of the Micro Base Station, identical to the AU-ODU of the modular Base Station, is a high power, full duplex multi-carrier radio unit that connects to an external antenna. It is designed to provide high system gain and interference robustness utilizing high transmit power and low noise figure. It supports a bandwidth of up to 14 MHz, enabling future options such as increased capacity through the use of a multiplexer or larger channels (e.g. 7/14 MHz).

The Micro Base Station unit connects to the AU-ODU via an Intermediate Frequency (IF) cable, carrying full duplex data, control and management signals between the Micro Base Station and the AU-ODU, as well as power (48 VDC) and 64 MHz synchronization reference clock from the Micro Base Station IDU to the AU-ODU. The IF Tx and Rx frequencies are 240 MHz and 140 MHz, respectively. IDU ODU service channel at 14 MHz serves for bi-directional control, status and management signaling.

1.1.4 Power Feeder

The ODU Power Feeder is used to provide power (-48 VDC) to AU-ODU-HP High Power ODUs. It transfers transparently all signals between the AU-IDU/Micro Base Station and the ODU, while injecting DC power received from an external source. Each ODU Power Feeder unit can serve up to four High Power ODUs. Up to three ODU Power Feeder units can be installed in a 1U high Power Feeder panel. For information on the number of ODUs and Power Feeder modules

required for various radio configurations, refer to the *BreezeMAX Base Station System Manual*.

Figure 1-10: Power Feeder

1.1.5 Installation

- The BST Indoor Unit (both Modular and Micro) can be installed in a 19" or 21" (ETSI) rack. See 5.1. For details on installing the various modules in the BST chassis, refer to 5.1.1.1.
- The BST Outdoor Unit and antenna can be mounted on:
  - A 1" to 4" pole. See 5.2.3 and 5.2.4.
  - A tower. See 5.2.6.
  - "H" Mounting Bracket for Antennas and ODUs. See Appendix C.

1.2 The Modular Base Station System Configuration

The Base Station Equipment is based on an 8U high cPCI (compact Peripheral Component Interconnect) shelf designed for installation in a 19" or 21" (ETSI) rack.

The six single Euro slots are intended for one or two Power Interface Units (PIU) and up to four Power Supply Units (PSUs). For the required number of PSUs, see Table 1-1 and Table 1-2.

One of the double Euro slots is dedicated to the Network Processing Unit (NPU) module, supporting a central networking and management architecture. Another double Euro slot is reserved for an optional redundant NPU (NPU redundancy support is planned for future release).

The remaining seven double Euro slots are dedicated mainly for Access Unit (AU) indoor modules, thus enabling various future redundancy configurations. Each of these slots will also be able to host a Network Interface Unit (NIU) to allow for NxE1 or ATM backbone connectivity in future releases.

Additionally, the Base Station chassis contains an air convection and ventilation fan tray (AVU).

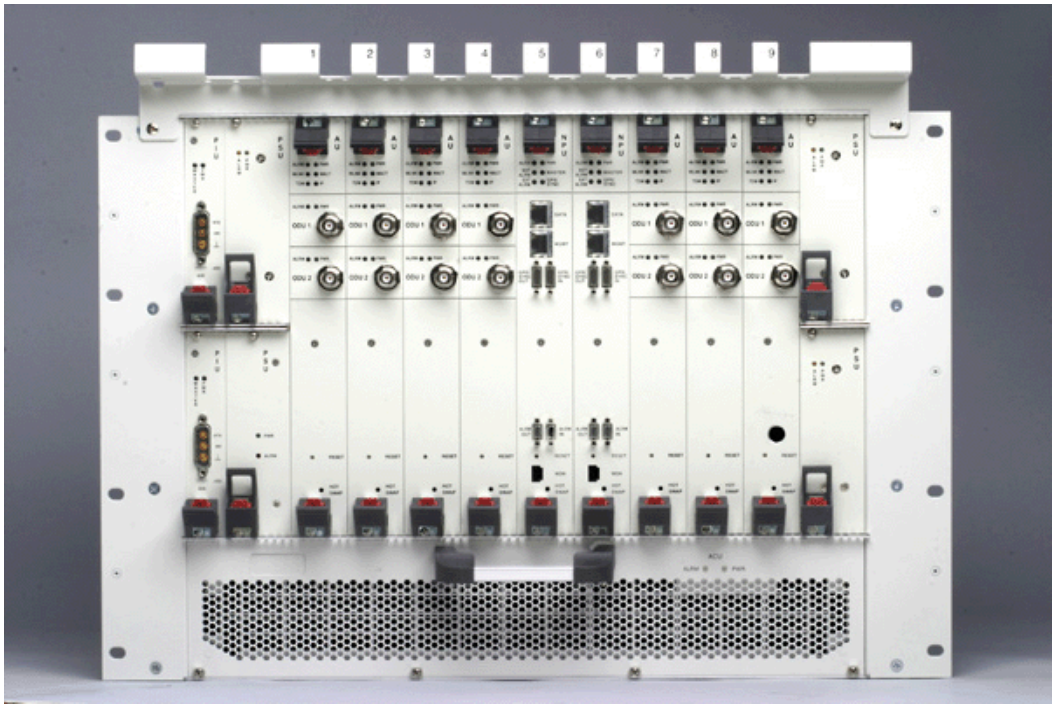


Figure 1-11: Base Station

Table 1-1: PSU Requirements, Configurations with one NPU

Number of AUs	Minimum Required Number of PSUs
1 - 2	1
3 - 6	2

Table 1-2: PSU Requirements, Configurations with two NPUs

Number of AUs	Minimum Required Number of PSUs
1 - 5	2
6	3

1.3 Networking Equipment

The modular Base Station/Micro Base Station equipment is connected to the backbone through standard data communication and telecommunication equipment. The NPU aggregates the traffic from all AUs, connecting to the backbone through a 100/1000 Base-T port. The Micro Base Station also connects to the backbone through a 10/100 Base-T port.

The point-to-point link from the Base Station (both modular and Micro) to the backbone can be either wired or wireless.

1.4 Network Management

The system's end-to-end IP-based architecture enables full management of all components, using standard management tools. An SNMP agent in the NPU/Micro Base Station implements standard and proprietary MIBs for remote setting of operational modes and parameters of the Base Station equipment as well as all other system components that are managed by it.

Security features incorporated in BreezeMAX units restrict the access for management purposes.

A serial RS-232 port supports local configuration, monitoring and debugging.

In addition, the Ethernet WAN can be used to connect to other Operation Support Systems including servers, Customer Care systems and AAA (Authentication, Authorization and Admission) tools.

1.4.1 AlvariSTAR™

AlvariSTAR is a comprehensive Carrier-Class network management system for Alvarion's Broadband Wireless Access products-based Networks. AlvariSTAR is designed for today's most advanced Service Providers' Network Operation Centers (NOCs), providing the network Operation, Administration and Maintenance (OA&M) staff and managers with all the network surveillance, monitoring and configuration capabilities that they require in order to effectively manage the BWA network while keeping the resources and expenses at a minimum.

AlvariSTAR is designed to provide the network's OA&M staff with a unified, scalable and distributable network management system. The AlvariSTAR system uses a distributed client-server architecture, which provides the service provider with a robust, scalable and fully redundant network management system in which all single points of failure can be avoided.

AlvariSTAR provides the following BWA network management functionality:

- Device Discovery
- Device Inventory
- Topology
- Fault Management
- Configuration Management

- Service Management
- Performance Monitoring
- Device embedded software upgrade
- Security Management
- Northbound interface to other Network Management Systems.

Embedded with the entire knowledge base of BWA network operations, AlvariSTAR is a unique state-of-the-art power multiplier in the hands of the service provider that enables the provisioning of satisfied customers. AlvariSTAR dramatically extends the abilities of the service provider to provide a rich portfolio of services and to support rapid customer base expansion.

For information on installing AlvariSTAR, refer to the AlvariSTAR Installation Manual.

1.4.2 AlvariCRAFT™

AlvariCRAFT is an SNMP (Simple Network Management Protocol) application designed for on-line management of BreezeMAX system components. This utility simplifies the installation and maintenance of small size installations by easily enabling the change of settings or firmware upgrade for one Base Station at a time, including the managed device's components and associated SUs.

AlvariCRAFT allows accessing a wide array of monitoring and configuration options, including:

- Device Manager for the selected Base Station, including it's NPU, AUs and SUs
- Selected unit configuration modification
- Local Service Profiles verification and modification
- Local Service Provisioning
- Firmware upgrade for the NPU, AUs and SUs
- On-line performance data monitoring
- Export of configuration details to a CSV file

- Support for Telnet cut-through to the Base Station

1.5 Product Specifications

1.5.1 Radio

Table 1-3: Radio Specifications

Item	Description		
Frequency	Unit/Band	Uplink (MHz)	Downlink (MHz)
	AU-ODU-3.3e	3366-3385	3316-3335
	AU-ODU-3.3f	3381-3400	3331-3350
	AU-ODU-3.3g	3300-3324	3376-3400
	AU-ODU-3.5a	3399.5-3453.5	3499.5-3553.5
	AU-ODU-3.5b	3450-3500	3550-3600
	AU-ODU-3.6a	3600-3653.5	3700-3753.5
	AU-ODU-3.6b	3646.5-3700	3746.5-3800
Operation Mode	FDD, Full duplex		
Channel Bandwidth	■ 3.5 MHz ■ 1.75 MHz		
Central Frequency Resolution	0.125 MHz		
Antenna Port (AU-ODU)	N-Type, 50 ohm		
Max. Input Power (at AU-ODU antenna port)	-50 dBm before saturation, -17 dBm before damage		
Output Power (at AU-ODU antenna port)	AU-ODU: 13 to 28 dBm +/-1 dBm (excluding 3.6 GHz ODUs) 3.6 GHz AU-ODU: 18 to 28 dBm +/-1 dBm AU-ODU-HP: 24 to 34 dBm +/-1 dBm		
Modulation	OFDM modulation, 256 FFT points; BPSK, QPSK, QAM16, QAM64		
FEC	Convolutional Coding: 1/2, 2/3, 3/4		

Table 1-3: Radio Specifications

Item	Description				
Bit Rate and Typical Sensitivity (PER=1%)		3.5 MHz bandwidth		1.75 MHz bandwidth	
	Modulation & Coding	Net Phy Bit Rate (Mbps)	Sensitivity (dBm)	Net Phy Bit Rate (Mbps)	Sensitivity (dBm)
	BPSK 1/2	1.41	-100	0.71	-103
	BPSK 3/4	2.12	-98	1.06	-101
	QPSK 1/2	2.82	-97	1.41	-100
	QPSK 3/4	4.23	-94	2.12	-97
	QAM16 1/2	5.64	-91	2.82	-94
	QAM16 3/4	8.47	-88	4.24	-91
	QAM64 2/3	11.29	-83	5.65	-86
	QAM64 3/4	12.71	-82	6.35	-85

1.5.2 Base Station Antennas (optional)

1.5.2.1 Electrical

Table 1-4: Base Station Antennas, Electrical Specifications

Item	Description
BS ANT 60V/3.3-3.8	16.5 dBi minimum in the 3.3-3.8 GHz band, 60° AZ x 10° EL, vertical polarization, compliant with ESTI EN 302 085 V.1.1.2 (2001-02) CS2.
BS ANT 90V/3.3-3.8	15 dBi typical in the 3.3-3.8 GHz band, 90° AZ x 9° EL, vertical polarization, compliant with ESTI EN 302 085 V.1.1.2 (2001-02) CSI,CS2,CS3
BS ANT 120/3.5V	14 dBi typical in the 3.3-3.7 GHz band, 120° AZ x 6.7° EL, vertical polarization, compliant with ESTI EN 302 085 V.1.2.3 (2005-09) CS1.
BS ANT 60/3.5H	16 dBi typical in the 3.4-3.6 GHz band, 60° AZ x 9° EL, horizontal polarization, compliant with EN 302 085, V1.1.1 CS3
BS ANT 90/3.5H	14 dBi typical in the 3.4-3.6 GHz band, 85° AZ x 9° EL, horizontal polarization, compliant with EN 302 085, V1.1.1 CS3
Omni ANT 3.4-3.6	10 dBi typical in the 3.4-3.6 GHz band, 360° AZ x 9° EL, vertical polarization
Omni ANT 3.3-3.5	10 dBi typical in the 3.3-3.5 GHz band, 360° AZ x 9° EL, vertical polarization

1.5.2.2 Mechanical

Table 1-5: Base Station Antennas, Mechanical Specifications

Unit	Description	Dimensions (cm)	Weight (kg)
BS ANT 60V/3.3-3.8	Mounting kit: 2" to 4" pole Connector: N-Type female	50 x 20 x 3	1.5
BS ANT 90V/3.3-3.8	Mounting kit: 2" to 4" pole Connector: N-Type female	53.6 x 36 x 3	2.3
BS ANT 120/3.5V	Mounting kit: 0.75" to 2" pole Mechanical tilt: 0° to -30° Connector: N-Type female	76.2 x 8.3 x 7.6	2.0
BS ANT 60/3.5H	Mounting kit: 2" to 4" pole Connector: N-Type female	48 x 20 x 4	2
BS ANT 90/3.5H	Mounting kit: 2" to 4" pole Connector: N-Type female	60 x 25 x 5.5	2
Omni ANT 3.4-3.6	Mounting bracket: 30 to 53 mm pole. Connector: N-Type female	67.5 x 8 x 7.8	0.29
Omni ANT 3.3-3.5	Mounting bracket: 30 to 50 mm pole. Connector: N-Type female	67.5 x 8 x 7.8	0.29

1.5.3 IDU-ODU Communication

Table 1-6: AU/Micro Base Station IDU to AU-ODU Communication

Item	Description
IF Frequency	■ Tx: 240 MHz ■ Rx: 140 MHz
Ref Synchronization Frequency	64 MHz
Bi-Directional Control Frequency	14 MHz
IF cable Impedance	50 ohm
Maximum IF cable Attenuation	AU-ODU: 19 dB @ 240 MHz, 15 dB @ 140 MHz , 8 dB @ 64 MHz AU-ODU-HP: 19 dB @ 240 MHz, 15 dB @ 140 MHz , 8 dB @ 64 MHz
Minimum IF cable Shielding Effectiveness	90 dB in the 10-300 MHz band

Table 1-6: AU/Micro Base Station IDU to AU-ODU Communication

Item	Description
Maximum IF cable Return Loss	20 dB in the 10-300 MHz band
Maximum IF cable DC Resistance	AU-ODU: 4.0 ohm AU-ODU-HP: 1.5 ohm

1.5.4 Data Communication

Table 1-7: Data Communication (Ethernet Ports)

Item	Description	
Standard Compliance	IEEE 802.3 CSMA/CD	
Maximum Packet Size	1550 Bytes (including 4 CRC bytes and 4 VLAN tag bytes)	
Speed	Data Port	Modular BST: 100/1000 Mbps, Full Duplex µBST: 10/100 Mbps, Full Duplex
	Management Port	10/100 Mbps, Half/Full Duplex with Auto Negotiation

1.5.5 Configuration Management

Table 1-8: Configuration and Management

Item	Description
Out Of Band (OOB) Management	■ Telnet via Management port ■ SNMP via Management port ■ Monitor port
In Band (IB) Management via Data Port	■ SNMP ■ Telnet
SNMP Agents	SNMP ver 1 client MIB II (RFC 1213), Private BreezeMAX MIBs
Authentication	X509v3 digital certificate
Software upgrade	Using TFTP
Configuration upload/download	Using TFTP

1.5.6 Standards Compliance

Table 1-9: Standards Compliance, General

Type	Standard
EMC	ETSI EN 301 489-1
Safety	■ EN 60950 ■ UL 60 950-1
Environmental	ETS 300 019: ■ Part 2-1 T 1.2 & part 2-2 T 2.3 for indoor & outdoor ■ Part 2-3 T 3.2 for indoor ■ Part 2-4 T 4.1E for outdoor
Radio	■ ETSI EN 301 753 V.1.1.1 ■ ETSI EN 301 021 V.1.6.1

1.5.7 Environmental

Table 1-10: Environmental Specifications

Type	Unit	Details
Operating temperature	Outdoor units	-40°C to 55°C
	Indoor equipment	0°C to 40°C
Operating humidity	Outdoor units	5%-95% non condensing, Weather protected
	Indoor equipment	5%-95% non condensing

1.5.8 Services

Table 1-11: Services - Modular Base Station

Item	Description
Max number of Services per BST	4,095 (0ne or several services may be defined per subscriber, one or more subscribers can be supported per SU)
Min number of data connections per Service	2 (1 uplink, 1 downlink)

Table 1-11: Services - Modular Base Station

Item	Description
Max number of data connections per Service	8 (4 uplink, 4 downlink)
Max number of data connections per SU	126
Max number of data connections per AU	3999 - 3 x number of SUs (3 connections are reserved for each SU)
Max number of SUs per AU	510
Max number of AUs per BST	7
Max number of MAC addresses in Bridging Table	BST: 6,000 SU: 512 (Aging time is configurable. The default is 3 minutes for SU, 10 minutes for NPU)
Max number of VLANs per Service	16
Max number of VLANs per SU	16
Max number of VLANs per BST	1,024
Max number of concurrent voice calls per Voice/L2 Service	50
Max number of concurrent voice calls per AU	300

Table 1-12: Services - Micro Base Station

Item	Description
Max number of Services per μBST	1,023 (0one or several services may be defined per subscriber, one or more subscribers can be supported per SU)
Min number of data connections per Service	2 (1 uplink, 1 downlink)
Max number of data connections per Service	8 (4 uplink, 4 downlink)
Max number of data connections per SU	126
Max number of data connections per μBST	3072 - 3 x number of SUs (3 connections are reserved for each SU)
Max number of SUs per μBST	250
Max number of MAC addresses in Bridging Table	μBST: 1,000 SU: 512 (Aging time is configurable. The default is 3 minutes for SU, 10 minutes for μBST)
Max number of VLANs per Service	16

Table 1-12: Services - Micro Base Station

Item	Description
Max number of VLANs per SU	16
Max number of VLANs per μBST	1,024
Max number of concurrent voice calls per Voice/L2 Service	50
Max number of concurrent voice calls per μBST	50

1.5.9 Electrical

Table 1-13: Electrical Specifications, Modular Base Station Equipment

Unit	Details
Power Source	-40.5 to -60 VDC
Full Base station including 1 ODU per AU	640W maximum for a fully equipped base station, including 6 ODUs (1 NPU, 6 AUs with 1 ODU per AU, 1+1 PIUs, 2+1 PSUs)
Full Base Station, including 2 regular ODUs per AU	868W maximum for a fully equipped Base Station, including 12 regular ODUs (1 NPU, 6 AUs with 2 ODUs per AU, 1+1 PIUs, 2+1 PSUs)
Full Chassis (excluding ODUs)	412W maximum for a fully equipped chassis, excluding ODUs (1 NPU, 6 AU-IDUs, 1+1 PIUs, 2+1 PSUs)
Base Station with 4 AUs, including 1 regular ODU per AU	470W maximum for a chassis with 4 AUs, including 4 regular ODUs (1 NPU, 4 AUs with 1 ODU per AU, 1+1 PIUs, 2+1 PSUs)
Base Station with 4 AUs, including 2 regular ODUs per AU	621W maximum for a chassis with 4 AUs, including 8 ODUs (1 NPU, 4 AUs with 2 ODU per AU, 1+1 PIUs, 2+1 PSUs)
Chassis with 4 AUs (excluding ODUs)	317W maximum for a chassis with 4 AUs, excluding ODUs (1 NPU, 4 AU-IDUs, 1+1 PIUs, 2+1 PSUs)
Regular PIU	16W maximum (active PIU)
High-Power PIU	Power Consumption: 35W maximum (active PIU) Maximum Supplied Current: 58 A
PSU	200W maximum output power Efficiency: 80% minimum Input voltage: 38 VDC (min), 76 VDC (max), 48 VDC (nominal) Input current: 0-30 ADC Output voltage: 36 VDC (min), 74 VDC (max), 46 VDC (nominal) Output current: 0-15 ADC
NPU	65W maximum, 44W typical
AU-IDU	38W maximum, 27W typical IF Coax DC Supply: 48V
AU-ODU	32W maximum, 27W typical
AU-ODU-HP	95W maximum, 70W typical
ODU Power Feeder	Power Source: -40.5 to -60 VDC Power Dissipation: 2W per channel

Table 1-13: Electrical Specifications, Modular Base Station Equipment

AVU	24W maximum, 23W typical Air supply flow rate: 330 M3/hr Average inlet to exhaust air temperature raise according to the thermal analysis (8 fans, 320 M3/hr,592 Wt) - 5.6 Cdeg. Extrapolation to 10 fans and 492 WT (typical) - 4.5 Cdeg, Extrapolation to 10 fans and 700 WT (maximal) - 6.3 Cdeg.

Table 1-14: Electrical Specifications, Micro Base Station Equipment

Unit	Details
Power Source	AC model: 85 - 265 VAC, 47 - 63 Hz DC model: -40.5 to -60 VDC
Power Consumption (excluding ODUs)	87W maximum
Power Consumption with 1 regular ODU	125W maximum
Power Consumption with 2 regular ODUs	174W maximum
ODU Power Feeder	Power Source: -40.5 to -60 VDC Power Dissipation: 2W per channel

1.5.10 Mechanical

Table 1-15: Mechanical Specifications, Modular Base Station Equipment

Unit	Dimensions (cm)	Weight (kg)
BST-SH	8U ETSI type shelf, 8U x 43.19 x 24	6.9 (excluding AVU)
Regular PIU	3U x 5HP x 16	0.35
High-Power PIU	3U x 5HP x 16	0.45
PSU	3U x 8HP x 16	0.7
NPU	6U x 7HP x 16	0.7
AU-IDU	6U x 7HP x 16	0.6
AU-ODU	31.5 x 8.8 x 15.7	2.9
AU-ODU-HP	31.5 x 16 x 16	5.5
AVU	2U x 84HP x 16	1.7
Power Feeder panel	1U ETSI type panel	0.14

Table 1-15: Mechanical Specifications, Modular Base Station Equipment

Unit	Dimensions (cm)	Weight (kg)
Power Feeder Module	19.6 x 14.6 x 3.17	0.6
GPS Adapter	15.7 x 14.6 x 3.17	0.4
Outdoor GPS Receiver	Tubular enclosure, 15.5 D x 12.7 H	0.363

Table 1-16: Mechanical Specifications, Micro Base Station Equipment

Unit	Dimensions (cm)	Weight (kg)
Micro Base Station IDU	1U ETSI type shelf, 1U x 44.4 x 27.2	3
AU-ODU	31.5 x 8.8 x 15.7	2.9
AU-ODU-HP	31.5 x 16 x 16	5.5
Power Feeder panel	1U ETSI type panel	0.14
Power Feeder Module	19.6 x 14.6 x 3.17	0.6

1.5.11 Connectors

Table 1-17: Connectors, Modular Base Station Equipment

Unit	Connector	Description
Regular PIU	-48V	3 pin/40A D-Type male Amphenol P/N 717TWA3W3PHP2V4RRM6
High-Power PIU	-48V	5 pin/40A D-Type male. Harting P/N TB09693009044 (or equivalent)

Table 1-17: Connectors, Modular Base Station Equipment

Unit	Connector	Description
NPU	DATA	100/1000Base-T (RJ-45) with 2 embedded LEDs. Connection to the backbone: Cable connection to a PC: Crossed Cable connection to a hub/switch/router: Straight
	MGMT	10/100Base-T (RJ-45) with 2 embedded LEDs. Connection to OOB management: Cable connection to a PC: Crossed Cable connection to a hub/switch/router: Straight
	GPS/SYNC IN	15-pin micro D-Type jack. Connection to a GPS receiver or to an NPU in another chassis that supplies synchronization signals.
	GPS/SYNC OUT	15-pin micro D-Type jack. Supply of synchronization signals to another unit.
	ALRM-IN	9-pin micro D-Type jack. Connections to external alarm indicators (3 alarm inputs, NC or NO).
	ALRM-OUT	9-pin micro D-Type jack. Connections for activation of external devices (4 dry contact pairs).
	MON	3-pin low profile jack. Access for debugging and configuration using the Monitor program.
AU-IDU	ODU 1, ODU 2	2 x TNC jack, lightning protected. Connection to the AU-ODU.
AU-ODU, AU-ODU-HP	IF	TNC jack, lightning protected. Connection to the AU-IDU.
	ANT	N-Type jack, 50 Ohm, lightning protected. Connection to an external antenna.

Table 1-18: Connectors, Micro Base Station Equipment

Connector	Description	
Micro Base Station IDU	AC IN (on rear panel of AC model)	3 pin AC power outlet
	DC IN (on rear panel of DC model)	3 pin D-Type male Amphenol P/N 17TWA3W3PR157
	DATA	10/100Base-T (RJ-45) with 2 embedded LEDs. Connection to the backbone: Cable connection to a PC: Crossed Cable connection to a hub/switch/router: Straight
	MGMT	10/100Base-T (RJ-45) with 2 embedded LEDs. Connection to OOB management: Cable connection to a PC: Crossed Cable connection to a hub/switch/router: Straight
	ALRM IN	9-pin micro D-Type jack. Connections to external alarm indicators (3 alarm inputs, NC or NO).
	ALRM OUT	9-pin micro D-Type jack. Connections for activation of external devices (4 dry contact pairs).
	MON	3-pin low profile jack. Access for debugging and configuration using the Monitor program.
	ODU 1, ODU 2	2 x TNC jack, lightning protected. Connection to the AU-ODU.
AU-ODU, AU-ODU-HP	IF	TNC jack, lightning protected. Connection to the μBST.
	ANT	N-Type jack, 50 ohm, lightning protected. Connection to an external antenna.

Table 1-19: ODU Power Feeder Connectors

Name	Connector	Functionality
IDU 1 - 4	4 x TNC jacks	Connection to ODU connectors of AU-IDUs/Micro Base Station
ODU 1 - 4	4 x TNC jacks	Connections to IF connectors of AU-ODU-HP units
-48V	3-pin D-Type power jack	Connection to DC power source
⏚ (GND)	Grounding screw	Connection to ground (earth)

Table 1-20: Base Station 3.x GHz Antennas, Mechanical Specifications

Unit	Description	Dimensions (cm)	Weight (kg)
BS ANT 60V/3.3-3.8	Mounting kit: 2" to 4" pole Connector: N-Type female	76.6 x 15 x 8.7	2.2
BS ANT 90V/3.3-3.8	Mounting kit: 2" to 4" pole Connector: N-Type female	76.6 x 15 x 8.6	2.2
BS ANT 120V/3.3-3.8	Mounting kit: 0.75" to 2" pole Mechanical tilt: 0° to -30°. Connector: N-Type female	76.6 x 14.4 x 8.3	2.0
BS ANT 60/3.5H	Mounting kit: 2" to 4" pole Connector: N-Type female	50 x 20 x 2.8	2
BS ANT 90/3.5H	Mounting kit: 2" to 4" pole Connector: N-Type female	60 x 25 x 5.5	2
BS ANT 65/3.5 DP	Downtilt Mounting kit: 4 to 12 cm pole Connector: 2 x N-Type female	85.1 x 16 x 6.1	2 maximum
BS ANT 90/3.5 DP	Downtilt Mounting kit: 4 to 12 cm pole Connector: 2 x N-Type female	85.1 x 16 x 6.1	2 maximum
BS ANT 120/3.5 DP	Downtilt Mounting kit: 4 to 12 cm pole Connector: 2 x N-Type female	68.8 x 16 x 14.5	2 maximum
Omni ANT 3.4-3.6	Mounting bracket: up to 50 mm pole. Connector: N-Type female	67.5 tubular, 8 diameter	0.29

1.5.12 LEDs

Table 1-21: AU-ODU LEDs

Name	Description	Functionality
PWR	Power indication	■ Off - ODU is not powered ■ Green - ODU power OK
ALARM	Not Used	(Red - blinks shortly during ODU power up)
ETH (WLNK)	Wireless link status indication	■ Off - No SU is associated ■ Green - At least one SU is associated

Table 1-22: AU-IDU LEDs

Name	Description	Functionality
PWR	Power indication	■ Off - AU-IDU is not powered ■ Red - AU-IDU power supply failed (low power) ■ Green - AU-IDU power is OK
ALARM	Alarm indication	■ Off - AU-IDU is OK ■ Red - AU-IDU failure
WLINK	Wireless link status indication	■ Off - No SU is associated ■ Green - At least one SU is associated
WACT	IDU transmission indication	■ Off - No IDU transmission ■ Green - IDU transmission OK
SP	Spare	Not Used
IP	IP activity indication	■ Off - No downlink (AU to SU) IP activity ■ Green (blinking) - Downlink (AU to SU) IP activity
ODU1/ODU2 PWR	IDU to ODU Power Indication	■ Off - No IDU to ODU power output ■ Red - IDU to ODU power output failed ■ Green - IDU to ODU power output OK
ODU1/ODU2 ALRM		■ Off - IDU-ODU communication OK ■ Red - IDU-ODU communication failure

Table 1-22: AU-IDU LEDs

Name	Description	Functionality
HOT SWAP	IDU readiness for hot swap removal	■ Off: Power to the module is not disconnected, the AU-IDU is not ready for removal. ■ Blue: Power to the module can be disconnected and the AU-IDU can be safely removed. For instructions on using the HOT SWAP handles refer to 11.2.

Table 1-23: NPU LEDs

Name	Description	Functionality
PWR	Power indication	■ Off - NPU is not powered ■ Red - NPU power failure ■ Green - NPU power is OK
ALRM	NPU Alarm indication	■ Off - NPU is OK ■ Red - NPU failure
BST ALRM	Base Station chassis alarm indication	■ Off - All Base Station modules are OK ■ Red - Failure in one (or more) Base Station modules
EXT ALRM	External alarm indication	■ Off - No alarms ■ Red - Alarm received via the ALRM IN connector
MASTER	Master/Slave operation indication	■ Off - Secondary NPU (backup) ■ Green - Primary NPU
GPS/SYNC	GPS/IF clock synchronization functionality indication	■ Off - GPS/IF clock synchronization is disabled ■ Green - GPS/IF clock is synchronization enabled
HOT SWAP	NPU readiness for hot-swap removal	■ Off: Power to the module is on, the NPU is not ready for removal. ■ Blue: Power to the module can be disconnected and the NPU can be safely removed. For instructions on using the HOT SWAP handles refer to 11.2.

Table 1-24: PIU LEDs

PWR and MASTER/ACT LEDs		PIU Status
PWR	**MASTER/ ACT**	
Off	Off	Chassis is not connected to power
Red	Off	Power input is out of range or PIU card is damaged. Chassis is powered by the redundant PIU
Red	Green	Power input is out of range or PIU card is damaged. Chassis is powered by the PIU
Green	Off	Power to PIU is OK. PIU is in redundant mode and the chassis is powered from the other PIU
Green	Green	Power to PIU is OK. The chassis is powered from the PIU.
HOT SWAP LED		Off: Power from the module to the chassis is not disconnected, the PIU is not ready for removal Blue: Power from the module to the chassis can be disconnected and the PIU can be safely removed For instructions on using the HOT SWAP handles refer to Section 11.2..

Table 1-25: PSU LEDs

LED Status PWR	ALARM	Description
Off	Off	No power or fatal damage
Off	Red	Power input is out of range or PSU is damaged or PSU is inhibited by NPU.
Green	Off	Power is OK and PSU operates properly.

Table 1-26: AVU LEDs

LED Status PWR	ALARM	Description
Off	Off	No 5V power input.
Red	Red	12V power failed.
Green	Red	One or more fans have failed.
Green	Off	AVU operates properly.

Table 1-27: Micro Base Station LEDs

Name	Description	Functionality
PWR (1)	Power indication	■ Off - Micro Base Station is not powered ■ Red - Input power failure ■ Green - Micro Base Station power is OK
ALRM (2)	Micro Base Station alarm indication	■ Off - No Micro Base Station alarm ■ Red - Micro Base Station failure
SP (3)	Spare	Not Used
EXT ALRM (4)	External alarm indication	Red - External alarm (received via the ALRM IN port). Not applicable to the current release
WACT (10)	IDU transmission indication	■ Off - No IDU transmission ■ Green - IDU transmission OK
WLINK (11)	Wireless link status indication	■ Off - No SU is associated ■ Green - At least one SU is associated
ODU 1 PWR (12), ODU 2 PWR (16)	IDU to ODU Power Indication	■ Off - No IDU to ODU power output ■ Red - IDU to ODU power output failed ■ Green - IDU to ODU power output OK
ODU 1 ALRM (13), ODU 2 ALRM (15)	IDU-ODU communication status	■ Off - IDU-ODU communication OK ■ Red - IDU-ODU communication failure

Table 1-28: ODU Power Feeder LEDs

Name	Description	Functionality
PWR	Input power indication	■ Off - ODU Power Feeder is not powered ■ Green - ODU Power Feeder power is OK
ODU PWR 1 - 4	Output power indications	■ Off - AU-ODU-HP is not connected ■ Red - Power output problem (short or overload) ■ Green - AU-ODU-HP is connected and powered

2

Chapter 2 - Preparations and Precautions

In This Chapter:

2.1 Safety Instructions

Safety Considerations - DC Powered Equipment

CAUTION	ATTENTION
Risk of electric shock and energy hazard. Disconnecting one Power Interface Unit (PIU) disconnects only one PIU module. To isolate the Modular Base Station completely, disconnect both PIUs.	Risque de décharge électrique et d'electrocution. La déconnection d'un seul module d'alimentation (PIU) n'isole pas complètement la Station de Base Modulaire. Pour cela, il faut impérativement débrancher les deux modules d'alimentation (PIU).

Restricted Access Area: The DC powered equipment should only be installed in a Restricted Access Area.

Installation Codes: The equipment must be installed according to the latest edition of the country national electrical codes. For North America, equipment must be installed in accordance with the US National Electrical Code and the Canadian Electrical Code.

Overcurrent Protection: A readily accessible Listed branch circuit overcurrent protective device, rated 40A for the modular Base Station, must be incorporated in the building wiring.

CAUTION: This equipment is designed to permit connection between the earthed conductor of the DC supply circuit and the grounding conductor at the equipment.

Installation Instructions:

- The equipment must be connected directly to the DC Supply System grounding electrode conductor.
- All equipment in the immediate vicinity must be grounded in the same way, and not be grounded elsewhere.
- The DC supply system is to be local, i.e. within the same premises as the equipment.
- There shall be no disconnect device between the grounded circuit conductor of the DC source (return) and the point of connection of the grounding electrode conductor.

Lithium Battery

The battery on the NPU card/Micro Base Station is not intended for replacement by the customer. The NPU module should be sent for battery replacement every 8 years.

Caution

To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

Line Voltage

Before connecting this instrument to the power line, make sure that the voltage of the power source matches the requirements of the instrument.

Radio

The instrument transmits radio energy during normal operation. To avoid possible harmful exposure to this energy, do not stand or work for extended periods of time in front of its antenna. The long-term characteristics or the possible physiological effects of radio frequency electromagnetic fields have not yet been fully investigated.

Outdoor Units and Antennas Installation and Grounding

Ensure that outdoor units, antennas and supporting structures are properly installed to eliminate any physical hazard to either people or property. Make sure that the installation of the outdoor unit, antenna and cables is performed in accordance with all relevant national and local building and safety codes. Even where grounding is not mandatory according to applicable regulation and national codes, it is highly recommended to ensure that the outdoor unit and the antenna pole (when using external antenna) are grounded and suitable lightning protection devices are used so as to provide protection against voltage surges and static charges. In any event, Alvarion is not liable for any injury, damage or regulation violations associated with or caused by installation, grounding or lightning protection.

For additional information on grounding and lightning protection, refer to Section 2.3 and to Alvarion's *Lightning Protection* document, available for download at www.alvarion.com.

Disposal of Electronic and Electrical Waste

Disposal of Electronic and Electrical Waste

Pursuant to the WEEE EU Directive electronic and electrical waste must not be disposed of with unsorted waste. Please contact your local recycling authority for disposal of this product.

2.2 ESD Precautions

The Base Station includes devices that can be damaged by accidental introduction of ground or foreign voltages etc.

An electrostatic discharge on a component at a voltage exceeding 600 volt is sufficient to damage the component, even if mounted on a board.

All electronic components used in BreezeMAX are subject to ESD electrostatic discharges. Electrostatic discharges at voltage ratings below 4000 volts are not normally detected or perceived in any other form by the persons causing the actual discharges.

For example, the natural movements of a person wearing synthetic clothing may generate electrostatic voltages exceeding 10,000 V!

Components are damaged by an electrical break in the ultra-thin insulating layer in the integrated circuits (measuring typically 0.0001 mm). The damage may be serious and cause the immediate function failure or remain latent and occur later, only after a certain time span has elapsed, which could also be several years!

2.3 Lightning Protection Guidelines

This paragraph provides information for the installation of an effective grounding and suppression system, for the protection of Alvarion products against lightning. For a list of required accessories, see Table 3-5.

NOTE

In case of contradiction between this paragraph and the standard requirements of the country in which the equipment is installed, the more stringent of the standards will always apply.

In case of contradiction between this paragraph and installation instructions provided elsewhere by Alvarion, refer to the full version of the Lightning Protection document. The full version of the document can be downloaded from Alvarion's web site www.alvarion.com. It is recommended to check for updates of this document from time to time.

This section deals primarily with the grounding of the equipment being installed. It is not concerned with grounding against lightning or the grounding of buildings. The main role of a Grounding System is to minimize lightning damage.

IMPORTANT

Alvarion does not provide any warranties as to the effectiveness of the suggested measures. The implementation of the suggested measures is at the customer's own discretion. Under no circumstances will Alvarion be liable for any consequences resulting from the implementation or lack of implementation of the suggested measures.

The Grounding System must be maintained and checked periodically in accordance with local regulations.

2.3.1 Lightning Protection Principles

Lightning protection for Alvarion Outdoor Units (ODU) installed outdoors on towers or poles, is provided by ensuring minimum pickup of lightning induced transients, and by the suppression of transient voltages at the input and output terminals of both the Indoor and Outdoor units.

Minimizing the pickup of induced voltages is accomplished by isolating the Outdoor Units and cables from the lightning down current, and through the use of shielded cables with peripheral shield grounding.

The outdoor Radio Units and Antennas are connected mechanically to the tower or pole, which is in turn grounded in accordance with the requirements of most safety standards, therefore the Outdoor Units are grounded as well.

Isolating the outdoor units from the tower carrying the lightning down current is theoretically appealing, however, when the outdoor units are installed on conducting towers any such isolation will be rendered useless during rain.

Therefore, it is recommended to ground the Outdoor Units and the associated shield/signal grounds of the IF/RF cables to the tower or pole, which in turn, are grounded themselves in accordance with the requirements of most safety standards.

In order to limit the amount of lightning current flowing on the shields of the IF cables, only one grounding point for the shields to the tower or pole is allowed. This is the point where the Outdoor Units are grounded to the pole. In this way, the current arriving from the lightning to the earth will prefer the down conductor from the lightning rod or the structure of the tower or pole, rather than the path along the shield, thus protecting the Alvarion equipment.

In addition, the IF Cable shields must be grounded (at the other end) to the entry panel at the facility building.

To further protect the IF cables from lightning-induced voltages, the cables must be installed inside the tower or pole whenever possible, and must be isolated from the tower or pole structure and the down conductor. This ensures some degree of shielding of the IF cables from the effects of electromagnetic fields associated with lightning strikes, and provides protection against direct strikes to the cables.

2.3.2 Lightning Protection System Components

The components of a typical Lightning Protection System (LPS) are as follows:

- Air Terminal
- Down Conductor
- Outdoor Units Grounding
- Earth Termination System
- Lightning Protectors

2.3.2.1 Air Terminal

The Air Terminal is the part of the LPS that is intended to intercept lightning flashes.

The Air Terminal intercepts the downward-moving stepped leader of the lightning strike, by launching an upward-going attachment spark. Once the attachment is achieved, the bulk of the lightning current follows the ionized path. In this way, an Air Terminal diverts the lightning away from personnel and electronic equipment.

If an Air Terminal is not installed at the highest point of the tower or pole, the radio element connected to the highest point, usually the antenna, is the most likely attachment point.

The Air Terminal must be constructed of steel with a pointed tip. Referring to Figure 2-1 below, the height (H) of the Air Terminal tip above the highest Alvarion element on the tower or pole, typically the antenna, must be at least twice the distance (2 x d) between the outer surface of the antenna and the tower or pole. This will ensure a "protection cone" of 60° around the tower or pole. In areas of high lightning activity, the length (H) should be increased to up to 5 times the distance.

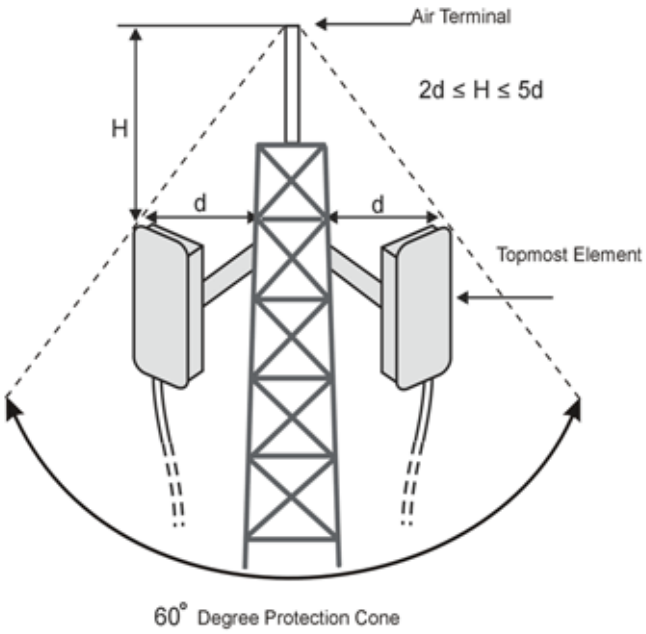


Figure 2-1: Air Terminal and Position Relative to Topmost Elements

The Air Terminal must be welded to the pole structure and connected to a Down Conductor.

2.3.2.2 Down Conductor

The Down-Conductor is the part of the external LPS that conducts lightning current from the Air Terminal system to the Earth Termination system (see Figure 2-2).

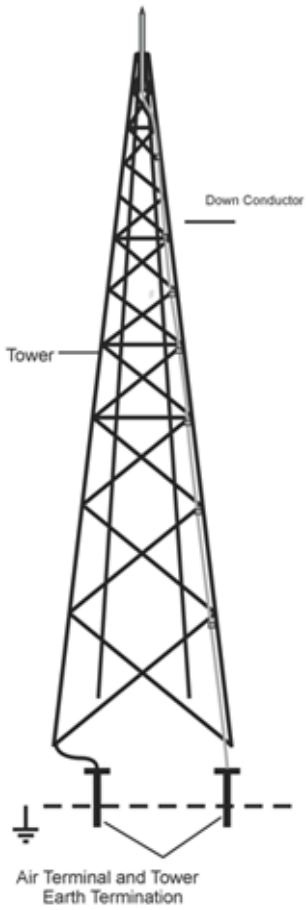


Figure 2-2: Down Conductor and Earth Termination

The Down Conductor must be installed straight and vertically in order to provide the shortest and most direct path to earth. The formation of bends must be avoided.

The following table defines the minimum dimensions for down conductors according to IEC 1024-1:

Table 2-1: Down Conductor Minimum Dimensions

Material	Conductor
Cu	16
Al	25
Fe	30

We recommend that the Down-Conductor be at least 50 mm2 or AWG 0 in all cases.

The grounding of the Down Conductor to earth must be of ground resistance no higher than 5 Ohm. This is achieved by using Earth Terminations and, wherever possible, grounding to the steel re-enforcement bars of the concrete base of the tower.

2.3.2.3 Grounding Outdoor Units

The Alvarion Outdoor Unit, consisting of a Radio Frequency Unit and Antenna, includes a grounding point for connection to the grounding system. See Section 2.3.1.

NOTE

For standard communication sites where the pole/tower is grounded, a standard Air Termination lightning rod is installed, coaxial (IF/RF) cables are grounded at the facility entrance, and the resistance between the Air Terminal and the Earth Termination is less than 5 : there is no need to ground the outdoor units (although such grounding will increase the level of protection).

2.3.2.4 Earth Termination System

The Earth Termination System is the part of external LPS that is intended to conduct and disperse lightning current to earth. See Figure 2-2.

2.3.2.5 Lightning Protectors (Surge Arrestors)

Lightning Protectors provide an additional protection to the Alvarion equipment embedded protectors, in places where lightning occurs with a high probability.

Electrical surges are composed of two elements: voltage and quantity of charge. A very high voltage surge can damage electronic equipment by breaking down the insulating medium between the circuit elements, or between the circuit elements and ground. In order to protect an electronic circuit from damage, a Lightning Protector (or Surge Arrestor) must conduct sufficient charge from the surge in order to lower the surge voltage to a safe level. It must also conduct fast enough in order to prevent the circuit insulation from breaking down.

Alvarion products contain embedded Lightning Protectors at their IF input ports.

Robust surge protection devices (SPD) are part of internal circuits, and are mounted on I/O ports connecting Indoor and Outdoor units via outdoor cables.

The Base station's IDU and ODU IF ports, are protected by high current capability TVSs mounted on board.

If additional protection is required, for example, in high lightning activity (Keraunic) areas, external Lightning Protectors can be installed at strategic points at the site.

NOTE

Keraunic maps are available at the following link to "Worldwide map of Keraunic levels" (http://perso.wanadoo.fr/parafoudres.eurema/Surges/WWMKL.htm).

A Lightning Protector will "clip" any excessive surge voltage that may be present on the center conductor.

For Alvarion's IF solutions, only "Gas Gap" Lightning Protectors types, designed to cover the IF frequency range, must be used. Only "Gas Gap" Lightning Protectors are capable of passing the DC current required to power the Outdoor Unit.

2.3.2.6 Installation Practices for an IF-Type System

This section relates to Base Station outdoor installation practices. Figure 2-3 shows radio equipment installed on a tower.

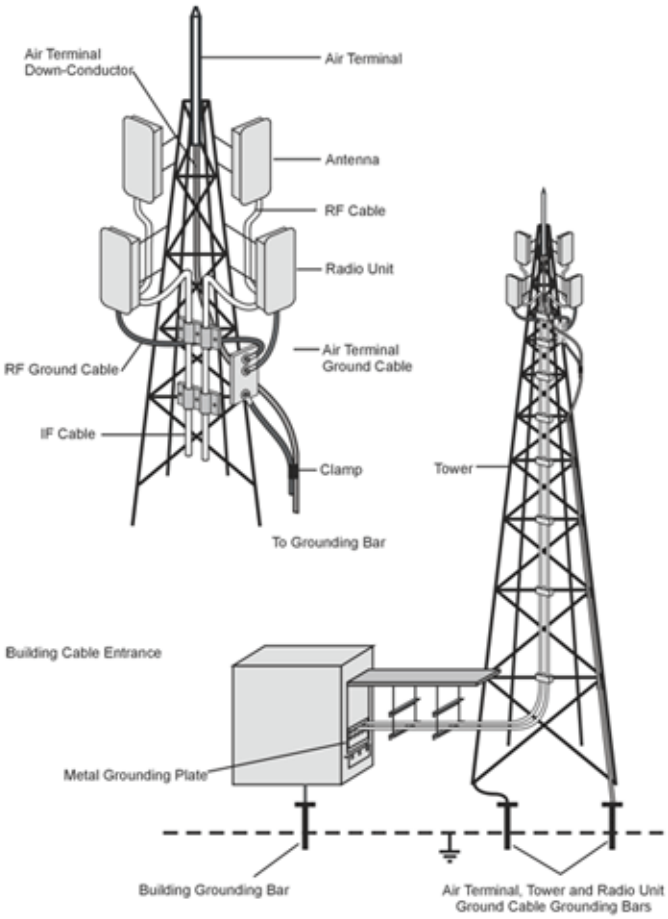


Figure 2-3: Radio Equipment Mounted on a Tower

Referring to Figure 2-3, an Air Terminal (Lightning Rod) is attached to the top of the tower.

The Air Terminal connects to a Down-Conductor that runs to an Earth Termination at the foot of the tower.

NOTE

The ground system must be maintained and checked periodically in accordance with local regulations.

The Antenna and Radio Units (two sectors are shown in Figure 2-3) are attached to the tower with mounting brackets. The Radio Units are connected to the Antennas via RF Cables. The IF Cables from the Radio Units (to the Indoor Units) run down the tower through Mounting Blocks, as shown in Figure 2-4.

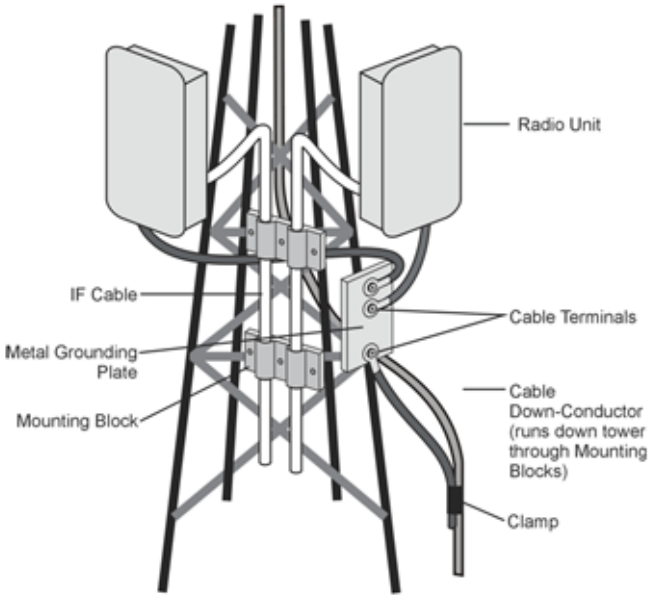


Figure 2-4: Mounting Blocks and Metal Grounding Plate

Referring to Figure 2-3 and Figure 2-4, the Radio Units' (ODU) ground cables are connected to a Metal Grounding Plate using Cable Terminals. The Metal Grounding Plate is connected (welded) to the tower. The Air Terminal Down Conductor is clamped to the cable that runs down from the Metal Grounding Plate.

At the entry point to the facility building, the IF Cable shields are physically attached to another Metal Grounding Plate (with feed through panel mount coaxial connectors for each cable. See Figure 2-5 below). The building's Metal

Grounding Plate is grounded separately from the tower. This ensures that the lightning current from the tower is diverted from the building.

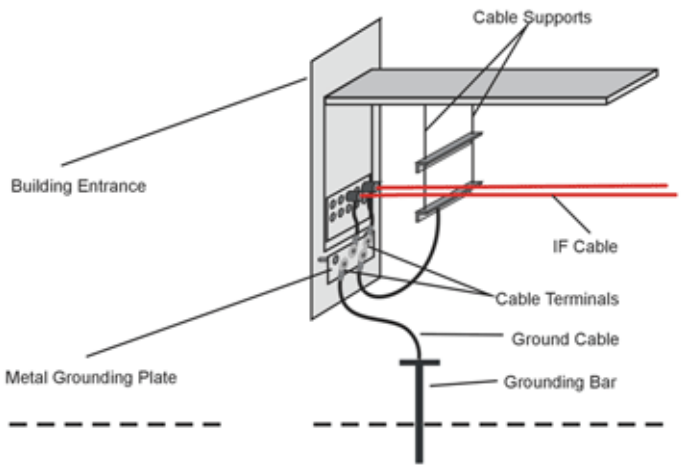


Figure 2-5: Metal Grounding Plate and Cable Entry to Facility Building

Figure 2-6 shows a similar layout for radio equipment installed on a pole.

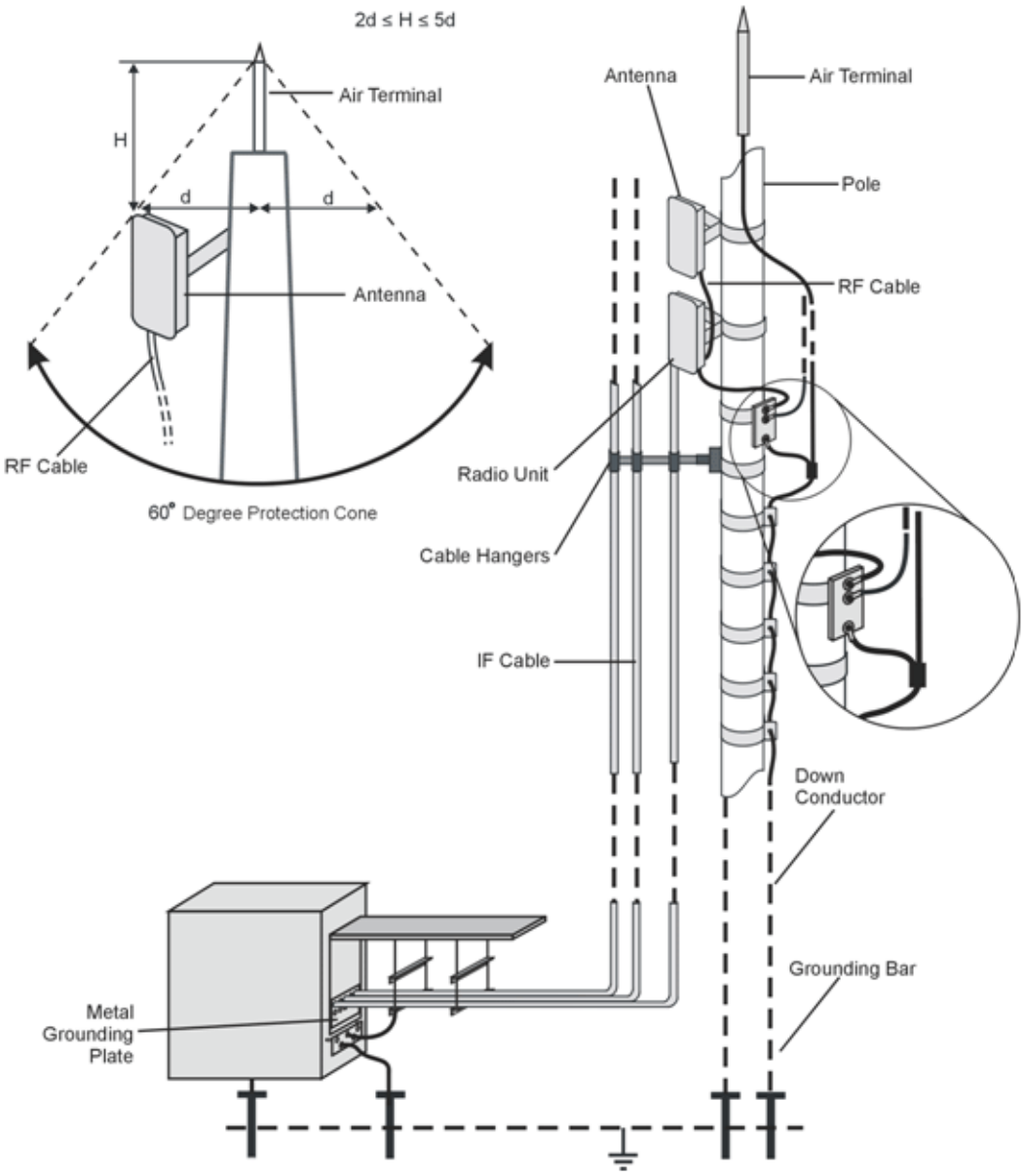


Figure 2-6: Radio Equipment Installed on a Pole

In Figure 2-6, an Air Terminal must provide a 60° protection cone, in the same manner as for the tower scenario described earlier.

The Antenna and Radio Unit (ODU) are attached to the pole with mounting brackets. The Radio Unit is connected to the Antenna via an RF Cable. The IF Cable from the Radio Unit (to an Indoor Unit) runs down the pole via Cable Hangers, and enters the building via a Metal Grounding Plate grounded at the building wall.

The IF Cable shields are physically attached to the building's Metal Grounding Plate, with feed through panel mount coaxial connectors for each cable. The building's Metal Grounding Plate is grounded separately from the pole. This ensures that the lightning current from the pole is diverted from the building. The Radio Unit's ground cable is attached to a Metal Grounding Plate (welded to the pole) using Cable Terminals.

The Radio Unit's ground cable, pole and the Air Terminal all run to Earth Terminations.

NOTE

For information on the attachment of a grounding cable to an Alvarion Outdoor Unit, see Section 6.5.1.

Figure 2-7 shows radio equipment installed on a tower, with external Lightning Protectors (Surge Arrestors) installed.

Lightning Protectors are installed on the IF Cables at close proximity to the Radio Units. The IF Cables run through the Metal Grounding Plate (isolated). The Lightning Protectors' ground leads are connected to the Metal Grounding Plate using Cable Terminals.

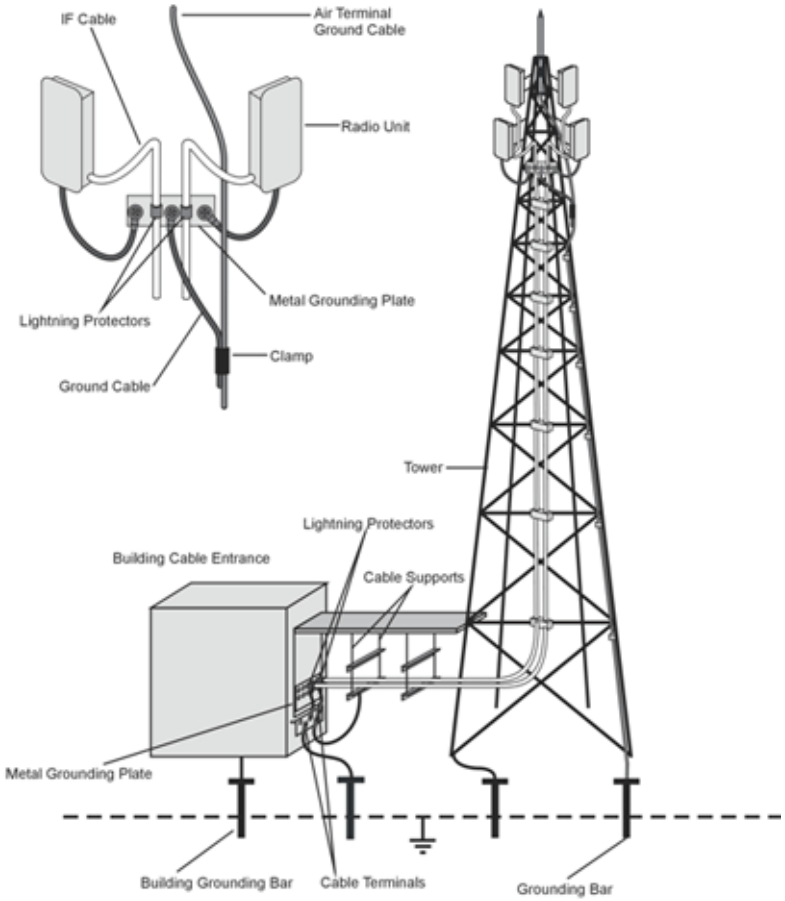


Figure 2-7: Radio Equipment and Lightning Protectors (Surge Arrestors)

At the facility building entrance, Lightning Protectors are installed on the IF Cables close to the Metal Grounding Plate apertures. The Lightning Protector ground lead is connected to an Earth Termination via another Metal Grounding Plate and cable terminals (see Figure 2-8).

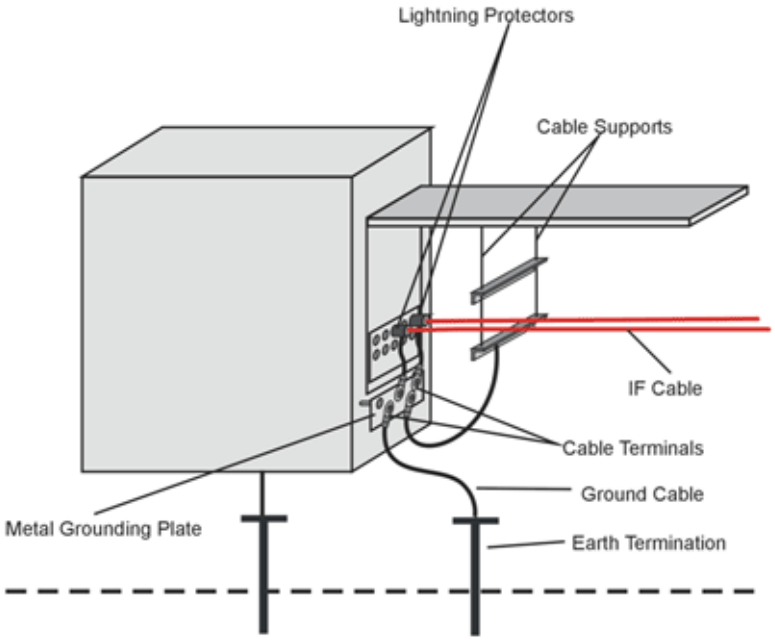


Figure 2-8: Lightning Protectors (Surge Arrestors) at Building Entrance

For further lightning protection guidelines and principles, refer to "Alvarion Lightning Protection" white paper (www.alvarion.com -> Customer Service area -> "White papers and Technology Tutorials" section.

For details on grounding the ODU and IDU, see Section 6.5.1 and Section 6.5.2 respectively.

3

Chapter 3 - Planning the Installation Site

In This Chapter:

Before unpacking the Base Station, you will need to select a suitable installation site. Choose a site that supports the physical characteristics of the unit and is in accordance with the unit's environmental and power requirements.

CAUTION

ONLY experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities should install outdoor units and antennas.

Failure to do so may void the BreezeMAX product warranty and may expose the end user or Service Provider to legal and financial liabilities. Alvarion and its resellers or distributors are not liable for injury, damage or regulation violations associated with the installation of Outdoor Units or antennas.

3.1 Guidelines for Positioning the ODU

3.1.1 Guidelines for Positioning the AU-ODU

This section provides key guidelines for selecting the optimal installation locations for the AU-ODU and its antenna.

CAUTION

ONLY experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities should install outdoor units and antennas.

Failure to do so may void the BreezeMAX product warranty and may expose the end user or Service Provider to legal and financial liabilities. Alvarion and its resellers or distributors are not liable for injury, damage or regulation violations associated with the installation of Outdoor Units or antennas.

Select the optimal locations for the equipment using the following guidelines:

- The ODU can be either pole or wall mounted. Its location should enable easy access to the unit for installation and testing.
- The higher the placement of the antenna, the better the achievable link quality.
- The antenna should be installed so as to provide coverage to all Subscriber Units within its service area.

NOTE

The recommended minimum distance between any two antennas in neighboring sectors is 0.5 meters.

The minimum distance between any two antenna in the same sector (space diversity configuration) is 10λ, where λ=C/Frequency (Hz). C is the speed of light in centimeters per second which is equal to 29,979,245,800.

The minimum distance between any two antenna in the same sector (space diversity configuration) is 1.3 meters.

- The ODU should be installed as close as possible to the antenna.

NOTE

An “H” kit for installation of up to 4 ODUs and 4 antennas that serve a single sector is optionally available from Alvarion. Refer to the detailed BreezeMAX TDD Base Station Installation & Maintenance Manual for information on installing the “H” accessory.

3.2 Guidelines for Positioning the Antenna

This section provides Base Station antennas and radio units' site planners and installers with general guidelines on where to position the antenna. The antenna should be positioned such that the coverage will not be affected by environmental conditions of the roof or house on which it is installed. For instructions on installing the antenna, refer to the manufacturer's installation instructions provided with the antenna.

The following paragraphs describe the various antenna installation scenarios on the sector level:

- Scenario 1 - The antenna is installed outside the boundaries of the roof.
- Scenario 2 - The antenna is installed on the edge of the roof.
- Scenario 3 - The antenna is installed toward the center of the roof.

NOTE

When positioning the antenna, follow the radio planning guidelines, if applicable. Otherwise, use the following guidelines.

- The higher the placement of the antenna, the better the achievable link quality.
- The antenna of the Access Unit should be installed so as to provide coverage to all Subscriber Units within its service area.

NOTE

The recommended minimum distance between any two antennas is 0.5 meters.

- The antenna should be installed to provide a direct, or near line of sight with the coverage area.

3.2.1 Scenario 1

In this scenario, the AU antenna is installed outside the boundaries of the roof. The antenna may be installed below the rooftop level, or on a pole outside the boundaries of the roof.

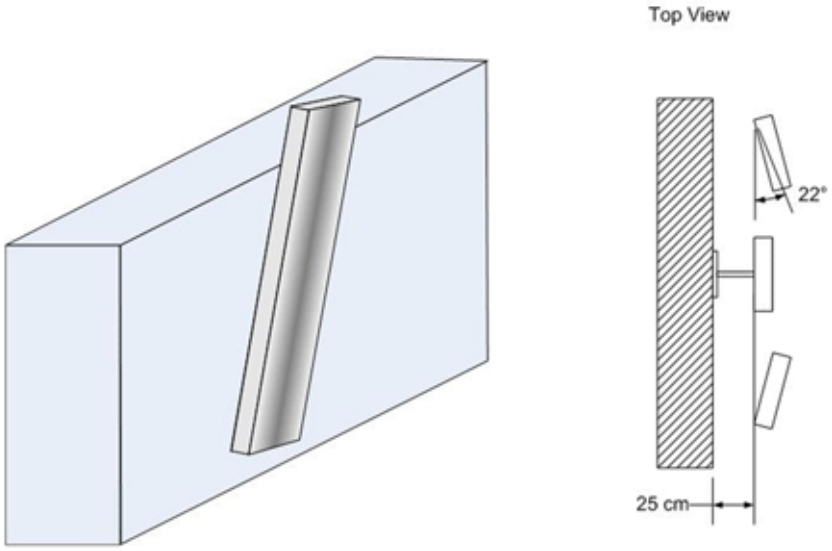


Figure 3-1: Antenna Installed Outside Roof's Boundaries

When the antenna is lower than the roof level or the railing's top, there are two limitations:

1 The minimum distance between the antenna and the railing or building side is 25 cm.

2 The angle between the antenna and the roof is 22 degrees.

These limitations assure that the antenna pattern is not affected by the reflections caused by the wall. If the wall is too close to the antenna, the antenna pattern is affected and the coverage of the site may not be as expected. This may also increase interferences to other sites.

3.2.2 Scenario 2

In this scenario, the antenna is installed on a pole on top of the railing. The antenna is not blocked by anything on the roof, or on adjacent roofs. In this scenario it is essential to maintain a minimum distance of 1.5m between the lower part of the antenna and the top of the roof, fence or railing, whichever is closer to the antenna.

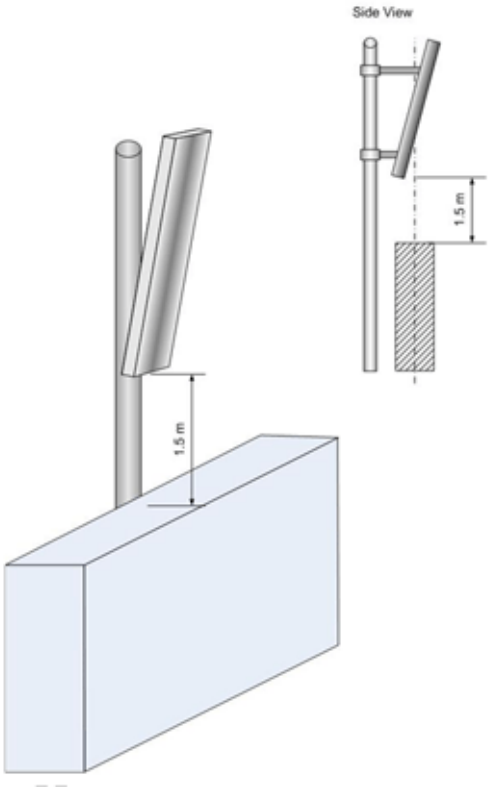


Figure 3-2: Antenna Installed on the Edge of the Roof

3.2.3 Scenario 3

In this scenario, the antenna is installed on a pole, similar to Scenario 2, and the pole is installed towards the center of the roof. The antenna may be blocked by objects on the roof or by the railing or fence. In this scenario it is essential to maintain a minimum distance between the lower part of the antenna and fence or railing, in order to minimize disturbance of the antenna's lobe. In this scenario, the railing or fence would create shading.

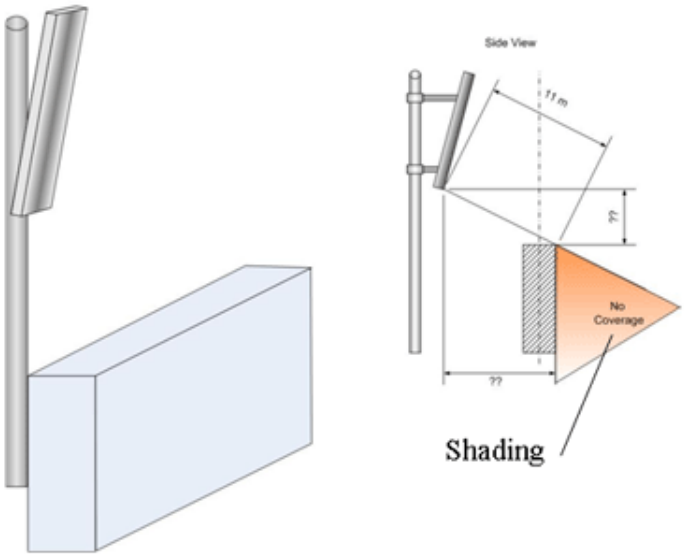


Figure 3-3: Antenna Installed at the Center of the Roof

The distance to the roof's floor and the fence depends on the distance of the antenna from the railing. The farther the horizontal distance of the antenna from the raising, the larger the vertical distance should be.

3.3 IF Cables

The AU-ODU is connected to the AU-IDU/Micro Base Station IDU via an IF cable carrying both signals and power. The maximum permitted attenuation of the IF cable at applicable frequencies, its screening effectiveness and its maximum permitted DC resistance (the sum of the DC resistance of the inner and outer conductors) are provided in Table 3-1.

Table 3-1: IF Cables Requirements

Item	Description
Screening Effectiveness	90 dB minimum in the 10-300 MHz band.
IF cable Impedance	50 Ohm
Maximum IF cable Attenuation	■ 19 dB @ 240 MHz ■ 15 dB @ 140 MHz ■ 8 dB @ 64 MHz
Maximum IF cable DC Resistance	4.0 Ohm
Maximum IF cable Return Loss	20 dB in the 10-300 MHz band

To comply with the required screening effectiveness requirement, it is recommended to use double shielded cables. Table 3-2 provides details on maximum length for some popular cables. For lengths above 150m, use a high quality cable with specifications as detailed in Table 3-1.

Table 3-2: Maximum IF Cable Length (Double Shielded Cables)

Cable	Maximum Length for AU-ODU	Maximum Length for AU-ODU-HP
LMR-195	80 meters	30 meters
LMR-240	150 meters	60 meters
LMR-400	250 meters	150 meters

3.4 Site Environmental Specification

Table 3-3: Environmental Specifications

Type	Unit	Details
Operating temperature	Outdoor units	-40°C to 55°C
	Indoor equipment	0°C to 40°C
Operating humidity	Outdoor units	5%-95% non condensing, Weather protected.
	Indoor equipment	5%-95% non condensing, Weather protected.
Storage/Transportation temperature	Outdoor and Indoor units	-40ºC to +70ºC
Storage/Transportation humidity	Outdoor and Indoor units	5%-95% non-condensing

3.5 Equipment Clearances/Minimum Distances

No space limitation. See, however, Section 3.4 for site environmental specifications.

3.6 Heat Dissipation

3.6.1 Modular Base Station

To calculate the heat dissipation of the Base Station:

Use the following formula to calculate the heat dissipation for each Base Station:

[(Module 1 power consumption) + (Module 2 power consumption) + … (Module N power consumption)] x 2.3884 = BTU

For example, for a Base Station with 1 AU and 1 NPU (and no redundancy), the heat dissipation is as follows:

[(PIU = 30 Watt) + (PSU = 200 Watt) + (NPU = 65 Watt) + (AU-IDU = 41 Watt) + (AVU = 24 Watt)] x 2.3884 = 860 BTU

3.6.2 Micro Base Station

To calculate the heat dissipation of the Base Station:

Use the following formula to calculate the heat dissipation for each Micro Base Station:

(Micro BST power consuption x No. of ODUs) x 2.3884 = BTU

For example, for a Micro Base Station with 2 ODUs, the heat dissipation is as follows:

72W x 2 x 2.3884 = 344 BTU

3.7 Cooling Requirements

3.7.1 Modular Base Station

The BreezeMAX chassis is intended for mounting in a cabinet or other rigid framework which is fixed to the building. A 2.2-meter or 2.6-meter rack can accommodate up to three BreezeMAX chasses. See Table 3-3 for the operating temperature range of the indoor equipment.

The BreezeMAX chassis is cooled by the flow of air between the elements mounted in the cabinet. The fans and air baffles ensure that sufficient air flows between the elements. The cooling system, including the baffle and fan tray, is supplied with each chassis and is an integral part of the BreezeMAX chassis. It does not require separate installation.

See Section 1.1.2 and Section 5.1.1.1 for details relating to the Air Ventilation Unit (AVU).

3.7.2 Micro Base Station

The Micro Base Station comes with 4 integral fans, located at the right side of the IDU. To ensure that sufficient air flows between the elements in the rack, the side panels of the Micro Base Station IDU must be ventilated.

3.8 Tools

The following table lists the recommended tools and sealing materials required for installation.

Table 3-4: Recommended Tools and Sealing Materials

Tool	Description
Spanners	¼" M3 M8, #13
Flat screwdriver	5.0 x 100
Phillips Screwdriver	2pt x 100
Crimpers	For N-type connectors (antenna connector) For TNC connectors (IDU-ODU connector) RJ-45 connector (IDU-ODU, Network cable)
Cable stripping tool	
Cutting tools	Cutter, knife, scissors, etc.
Materials	
Metal bands	Up to 14 mm width, for mounting the AU-ODU on a pole.
Strips	Plastic cable tie for outdoor use. Minimum width: 4.8 mm Minimum thickness: 1.3 mm
Isolation material	Any material for isolation. Must be waterproof and resistant to temperature change (-40°C to 60°C)
Measurement Tools	
Cable tester	For testing the cables with N-Type and TNC connectors.

The following table lists the accessories required for lightning protection. These accessories can be ordered from Alvarion.

Table 3-5: Lightning Protectors and Part Numbers

	Lightning Protector Description	Part Number
1	IF Lightening Arrestor with female TNC connectors. For use on IF cable of AU for 48 VDC, coax. For use on BreezeMAX 3000 Access Units only. For device specifications and installation instructions, please contact sales at:PolyPhaser Corporation, Tel: (1) 775.782.2511800.325.7170(US only)	PolyPhaser Model:BMAX-IF-ALVR-B
2	Baseband protection. For use on BreezeMAX SUs. Manufacturer: Transtector Systems Inc. Tel: (1) 208.772.8515 800.882.9110(US only) http://www.transtector.com/peripherals/alvarion/index.html	Transtector Model: ALPU-ALVR

4

Chapter 4 - Inspecting and Unpacking

In This Chapter:

4.1 Preliminaries

Examine the shipping container for damage. If you notice any damage, notify the carrier that delivered the unit immediately and enter a service call in Alvarion's SSM (www.alvarion.com > Customer Service area).

Check the items that have been sent against this manual. If any items are missing, notify your agent immediately.

4.2 Chassis/System

Confirm that the BST Chassis is upright before taking it out of the box.

Remove the packing material without damaging it.

The following figure lists the items shipped with the BST Chassis.

NOTE

The slots in the Base Station chassis are initially covered by blank panels. When installing a module in the chassis, remove only the respective blank panel. Four slots are not covered. These are for the mandatory modules: NPU, AU, PIU, and PSU. See Figure 5-1.

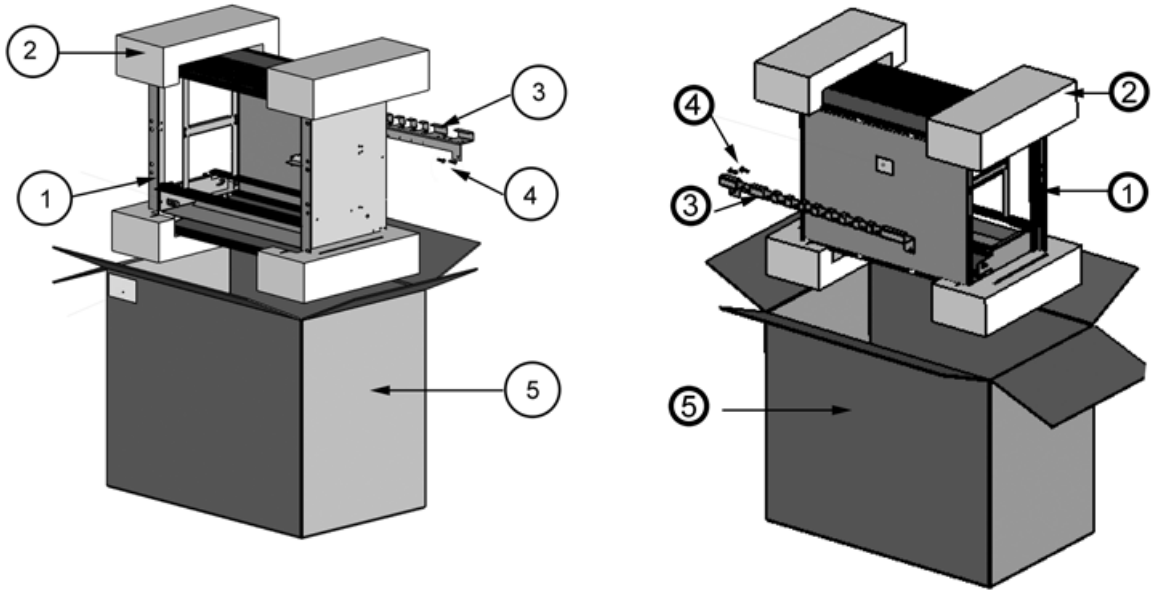


Figure 4-1: Chassis Packaging

1 - BST Chassis with assembled AVU

2 - Packing material

3 - Cable tray

4 - 2 screws for assembling the cable tray

5 - Cardboard box

4.3 AU-ODU/AU-ODU-HP

Confirm that the AU-ODU is upright before taking it out of the box.

Remove the packing material without damaging it.

The following figure lists the items shipped with the AU-ODU.

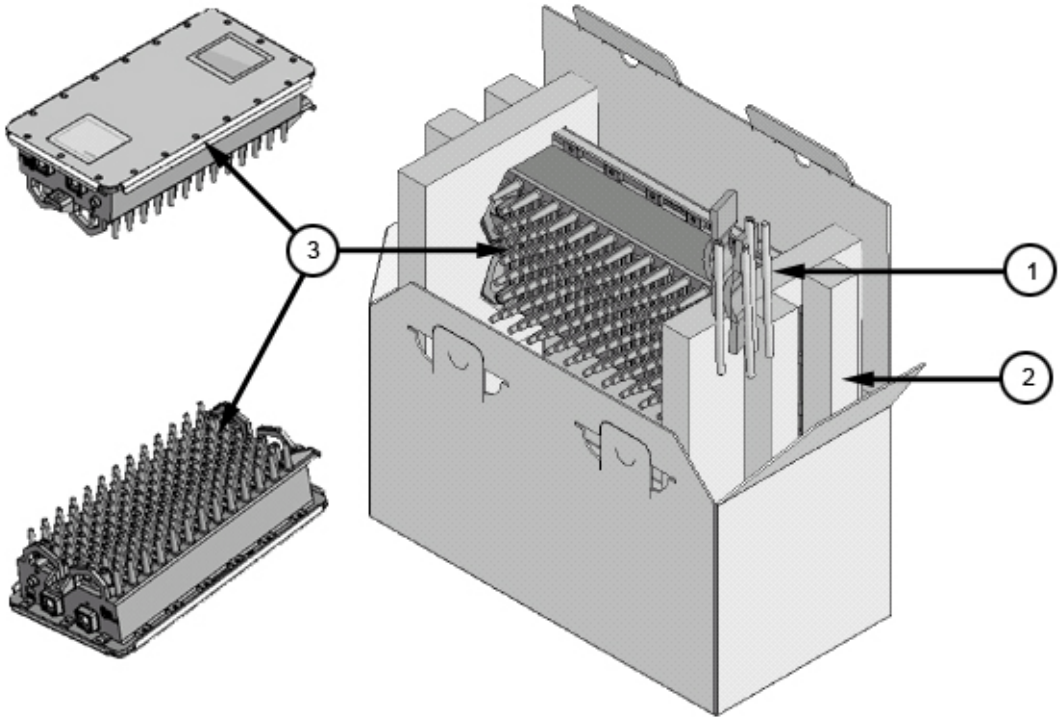


Figure 4-2: AU-ODU

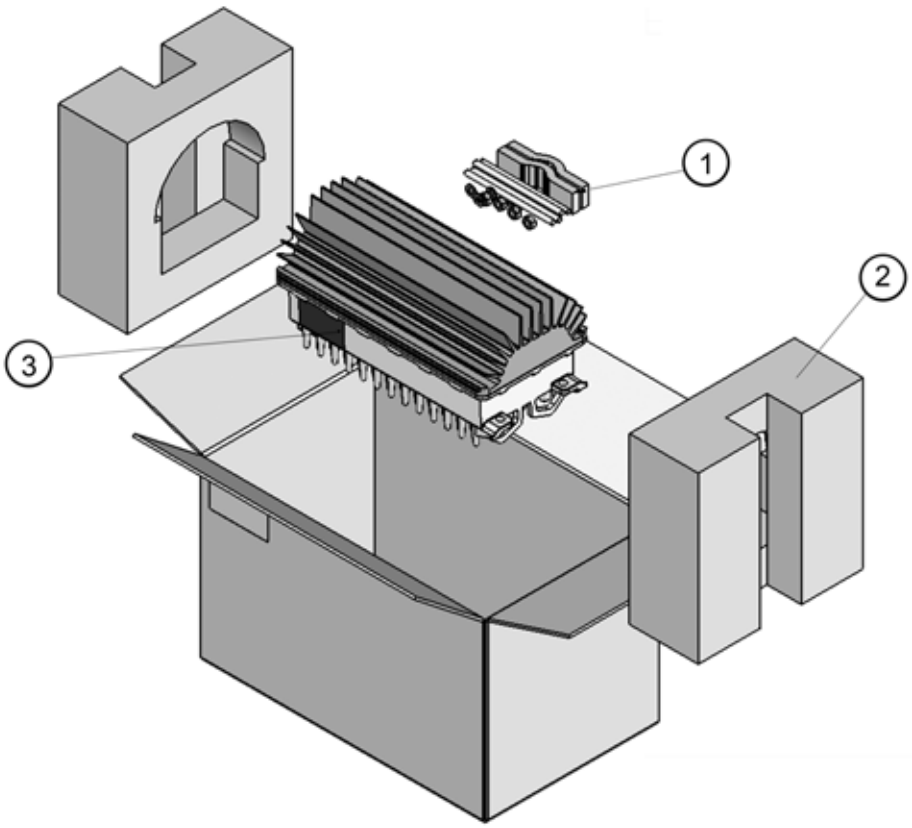


Figure 4-3: AU-ODU-HP

1 - Pole Mounting Kit (see Table 4-1).

2 - Packing material

3 - AU-ODU/AU-ODU-HP

Table 4-1: Pole Mounting Kit

Component	Description	Qty
MC2304	Rod ¼-20NC 85 mm (L), or M8 150mm (L)	4
MC2371-01	Mounting Clamp	2
NT1008	Nut Hex	4
WS1027	Flat washer ¼	4
WS1028	Spring lock washer ¼	4

4.4 Cards/Modules

Remove the packing material without damaging it.

Components susceptible to damage from static electricity are packed in static resistant bags. Unpack these items in a static-free environment to avoid damage. Cards contain CMOS devices. All tools, test equipment, metal objects, and personnel that come into contact with CMOS devices must be electrically grounded (drawing/photo).

The following figure lists the items shipped with each module. The modules are packaged separately.

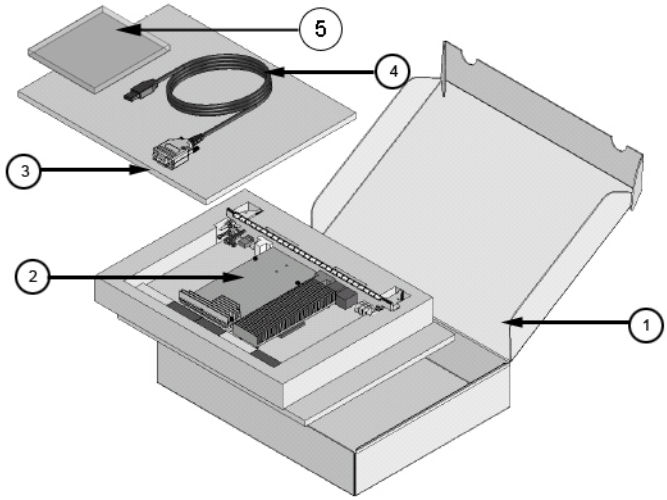


Figure 4-4: Module Items

1 - Cardboard box

2 - Module card

3 - Protective cover

4 - 2.5m DC Cable (with PIU only)/Monitor cable (with NPU only)

5 - CD (with NPU only)

4.5 Micro Base Station Indoor Unit

Remove the packing material without damaging it.

The following figure lists the items shipped with the Micro Base Station.

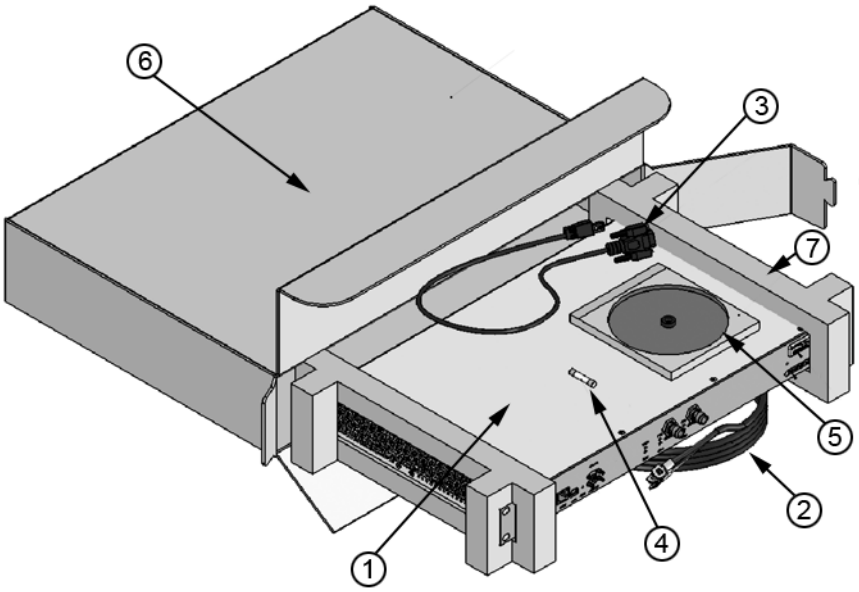


Figure 4-5: Micro Base Station Packaging

1 - Micro Base Station

2 - Mains power cable/DC power cable

3 - Monitor cable

4 - Fuse cartridge (DC model)

5 - CD

6 - Cardboard box

7 - Packing material

4.6 ODU Power Feeder

Remove the packing material without damaging it.

The following figure lists the items shipped with the ODU Power Feeder.

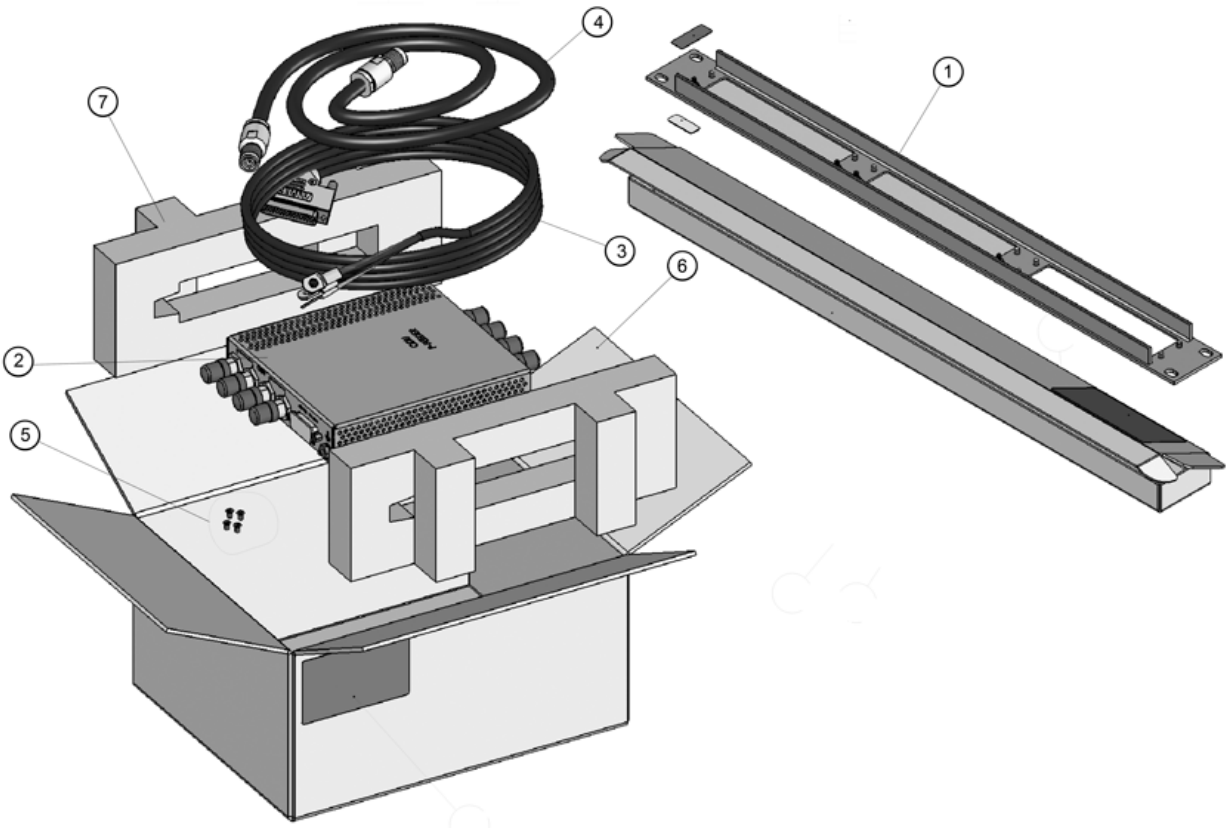


Figure 4-6: ODU Power Feeder Packaging

1 - A 19” panel (can hold up to three ODU Power Feeder modules) packed separately.

2 - ODU Power Feeder module

3 - DC power cable

4 - 4 IF cables (0.5 meter)

5 - 4 screws

6 - Cardboard box

7 - Packing material

5

Chapter 5 - Mechanical Installation

In This Chapter:

This chapter describes the procedures involved in installing the BST on site (general antenna alignment procedure). The pictures are for illustrative purposes only. The actual modules may differ depending on the type used.

5.1 Installing the Base Station Equipment in a Rack

The location of the indoor equipment should take into account its connection to the power source(s) and to the base station networking equipment.

In addition to the tools specified in Section 3.8, the following items are also required for installing the Base Station:

- Ethernet cable (straight) for connecting the NPU/Micro Base Station to a Hub/Switch.

NOTE

The maximum length of the Ethernet cable is 100m when operating at 100 Mbps and 70m when operating at 1 Gbps.

- A grounding cable with appropriate terminations for connecting the chassis/Micro Base Station to the rack or another ground (earth) connection.
- Mains plug adapter or termination plug (if the power plug on the AC power cord supplied with the Micro Base Station does not fit local power outlets).
- For installation in a 21" ETSI rack: Two 21" ETSI rack adapters
- A portable PC for configuring parameters using the Monitor cable (supplied with the NPU/Micro Base Station).

5.1.1 Modular Base Station

Before installing the BST-SH in the rack, you need to assemble the Cable Tray.

To assemble the Cable Tray:

1. Position the Cable Tray on the Base Station chassis such that the corner holes are aligned.

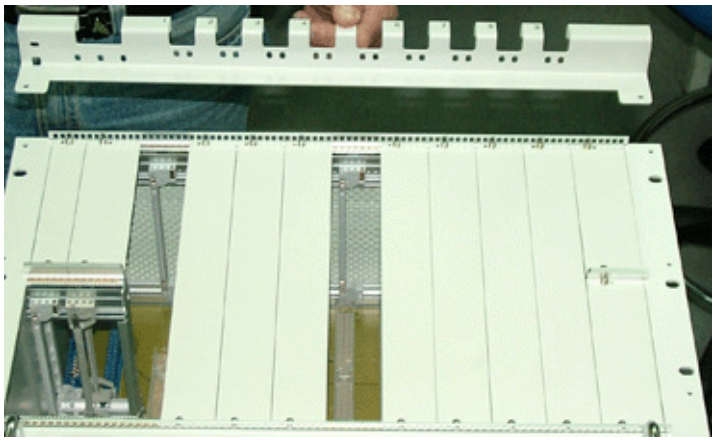


Figure 5-1: Positioning the Cable Tray

2 Assemble the Cable Tray on the Base Station chassis. Use a screw at either corner (the screws are supplied with the chassis (see Section 4.2).

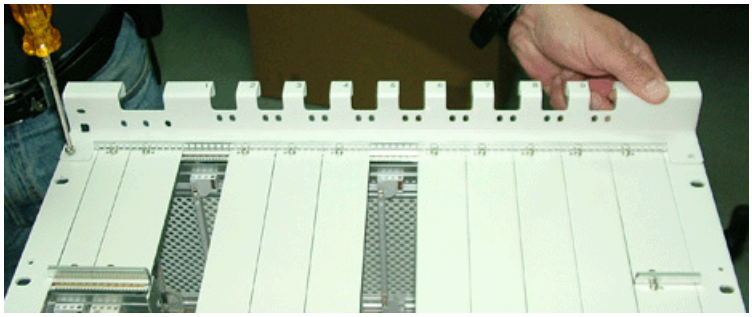


Figure 5-2: Assembling the Cable Tray

To install the BST-SH in a 19" rack:

1 Position the Base Station chassis in the desired location in a standard 19" rack. To provide sufficient space for the Cable Tray and to allow air flow for preventing over-heating, leave a free space of at least 1U between the upper cover of the chassis and other units in the cabinet.

2 Tighten 4 screws on either side until the Base Station chassis is firmly held in the rack.

3 Connect one end of a grounding cable to the ground terminal located on the rear panel of the chassis and firmly tighten the grounding screw. Connect the opposite end of the grounding cable to a ground connection or to the rack.

Figure 5-3: Installing the Base Station in a 19" Rack

To install the BST-SH in a 21" ETSI rack:

1. Position an adpater on either side of the Base Station chassis such that the adapter's holes are aligned with the holes on the chassis.
2. Tighten 4 screws on either side until the adapters are secure.
3. Proceed to assemble the chassis in the rack.

5.1.1.1 Inserting Modules

The Base Station modules include special injector/ejector handles for high-force insertion/extraction of modules. Each of the 6U high modules (NPU, AU-IDU) includes two such handles, whereas each of the 3U high-modules (PIU, PSU) includes a single handle at the bottom of the front panel.

The bottom injector/ejector handle of the NPU and AU-IDU modules includes a micro-switch to support hot-swap control.

The modules installed in the BST chassis are:

- AU

- NPU
- PIU
- PSU
- AVU

The Base Station chassis comprises 6 3U high slots and 9 6U high slots, as shown in Figure 5-4.

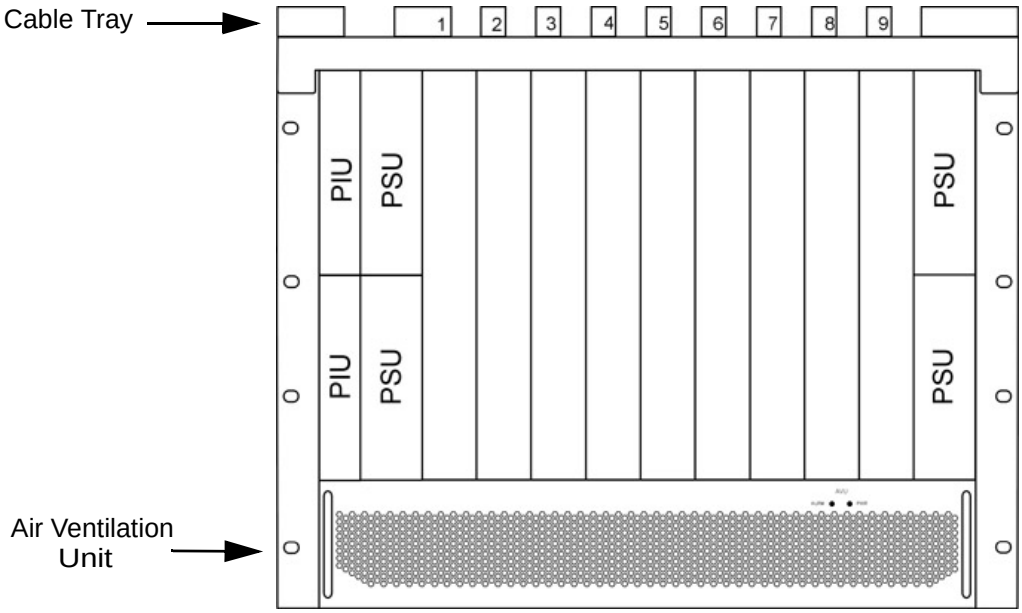


Figure 5-4: BMAX-BST-SH Chassis Slot Assignments

The Cable Tray should be installed on the top of the chassis front (the installation kit is supplied with the chassis) to enable convenient routing of cables connecting to power source(s), outdoor unit(s) and other equipment.

To enable power source and/or Power Interface Unit 1+1 redundancy, two PIU modules can be installed in the designated slots. If a single PIU module is used, it can be inserted into either of the two available slots.

The number of installed PSU modules depends on the specific configuration (number of AUs) and NPU redundancy scheme (see Table 1-1 and Table 1-2). If less than 4 PSU modules are used, they can be installed in any of the designated slots.

The NPU should be installed in slot number 5 (slot numbers are marked on the Cable Guide). Slot 6 is reserved for a future redundant NPU.

Slots 1-4 and 7-9 can hold up to six AU-IDU modules.

Unused slots should remain covered until required.

All the modules come with ejector handles that hold the module in position.

To insert a module in the BST chassis:

1 Release the top and bottom ejector handles by pressing the red latches and pulling the ejector handles in the direction of the arrow (see Figure 5-5).

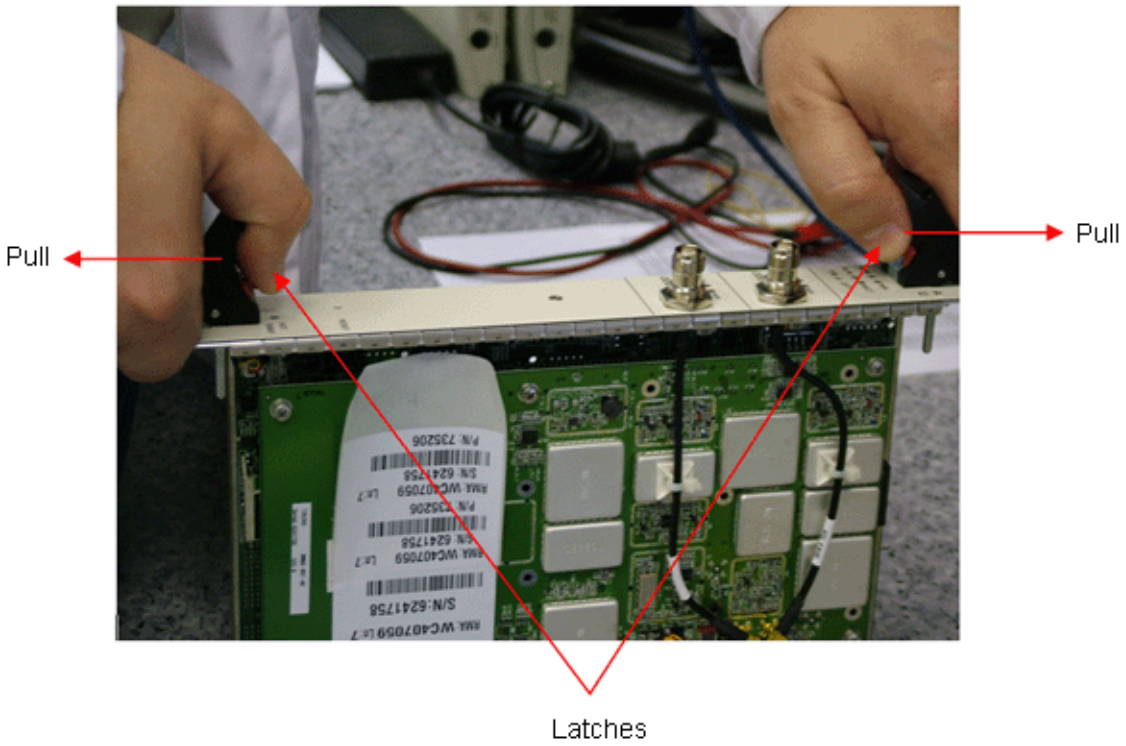


Figure 5-5: Releasing the Ejector Handles

NOTE

The PIU and PSU modules have only one handle.

2 Slide the module all the way in its designated position in the BST chassis (see Figure 5-6) and gently push the module using your fingers only, until the module's front panel reaches the front chassis rails.

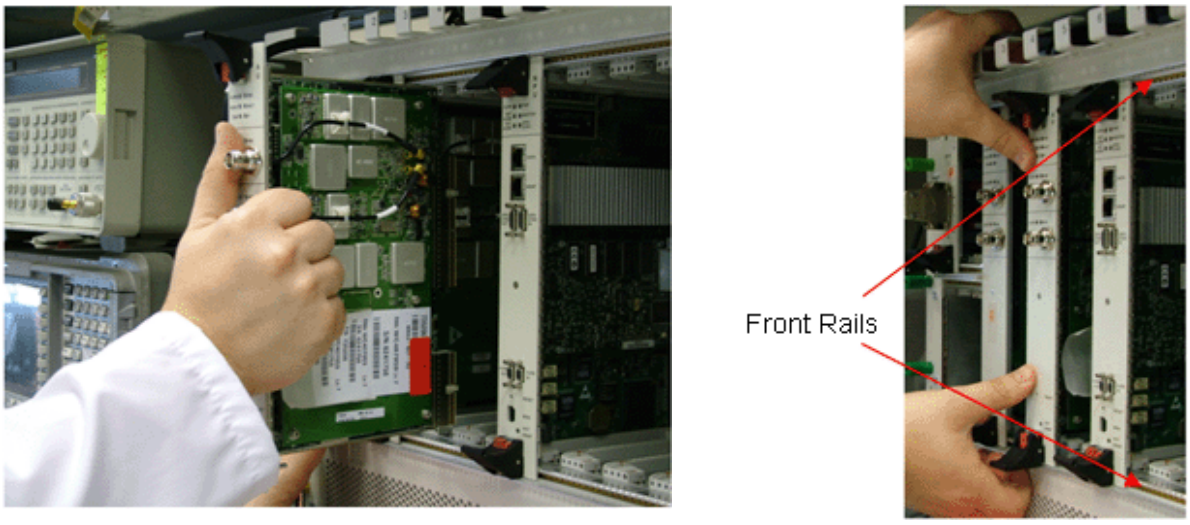


Figure 5-6: Positioning the Module in the BST Chassis

3 Press the handles gently toward each other until the handles' teeth latch into the top and bottom rails and the module is secure. When inserting an AU, NPU, or PIU, the blue HOT SWAP LED will briefly turn on, indicating that the module is being powered up.

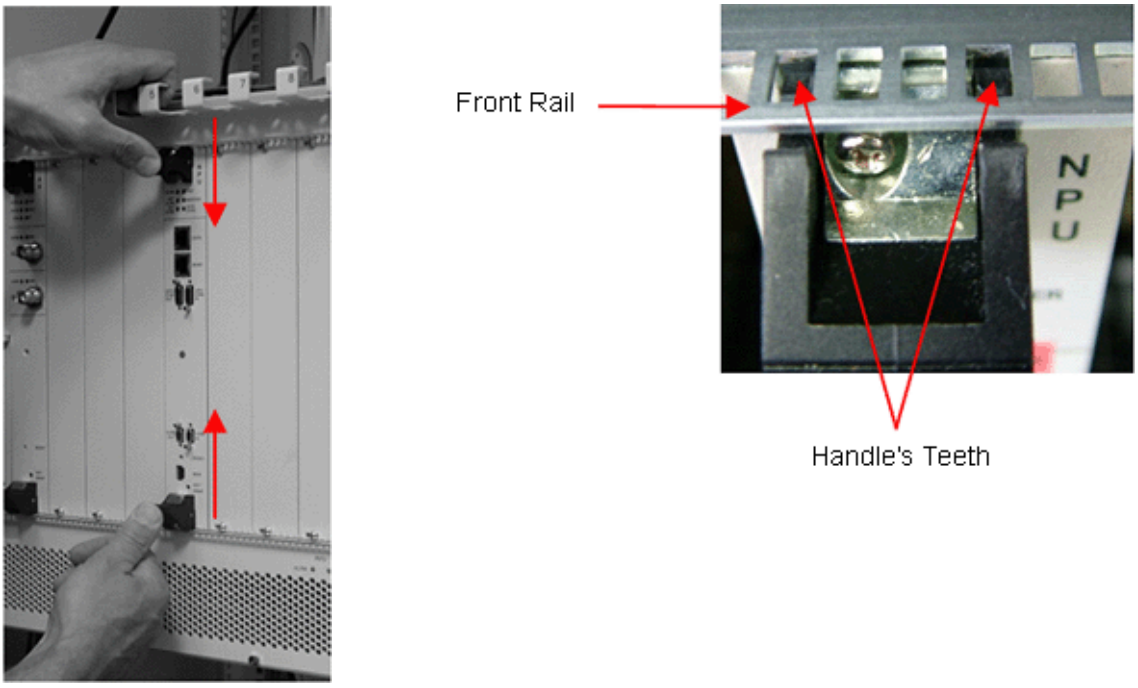


Figure 5-7: Securing the Module

4 Secure the module in place by closing the screws at the top and bottom of the front panel

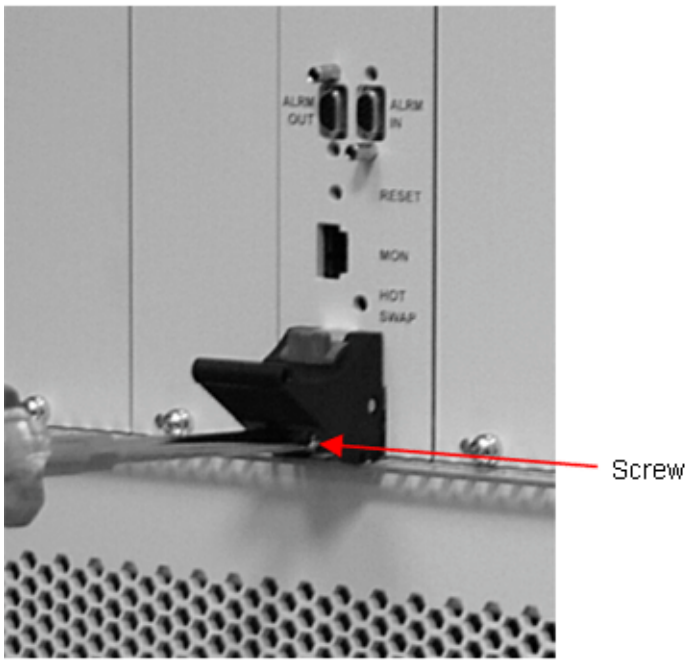


Figure 5-8: Securing the Module

NOTE

If a module is fully inserted without properly locking the handles, it will not become operational.

CAUTION

All of the above steps should be performed carefully. Using force to connect the modules to the chassis may damage the ejector handles.

5.1.2 Micro Base Station

To install the Micro Base Station in a 19" rack:

1. Position the Micro Base Station in the desired location in a standard 19" rack.
2. Tighten 4 screws on either side until the Micro Base Station is firmly held in the rack.
3. Connect one end of a grounding cable to the ground terminal located on the rear panel and firmly tighten the grounding screw. Connect the opposite end of the grounding cable to a ground connection or to the rack.

To install the Micro Base Station in a 21" ETSI rack:

1. Position an adpater on either side of the Micro Base Station IDU such that the adapter's holes are aligned with the holes on the IDU.
2. Tighten 4 screws on either side until the adapters are secure.

5.1.3 ODU Power Feeder

The ODU Power Feeder is used to provide power (-48 VDC) to AU-ODU-HP High Power ODUs. It transfers transparently all signals between the AU-IDU/Micro Base Station and the ODU, while injecting DC power received from an external source. Each ODU Power Feeder unit can serve up to four High Power ODUs. Up to three ODU Power Feeder units can be installed in a 1U high Power Feeder panel.

The ODU Power Feeder should be installed as close as possible to the location where the IF cable(s) enters the building. The location of the ODU Power Feeder should take into account its connection to the power source and to the Base Station equipment.

In addition to the tools specified in Section 3.8, the following items are also required for installing the ODU Power Feeder:

- A grounding cable with appropriate terminations for connecting the unit's ground terminal to the rack or to a ground connection.
- For installation in a 21" ETSI rack: two 21" ETSI rack adapters
- Other installation tools and materials

To install the ODU Power Feeder in a 19" rack:

1. The panel is supplied with blank covers. Release the nuts on the rear side of the panels to remove the blank cover(s) you want to replace with ODU Power Feeder module(s).
2. Position the Power Feeder in the designated slot of the Power Feeder panel such that the corner holes on the Power Feeder are aligned with the holes on the Power Feeder panel.

3 Attach the ODU Power Feeder module(s) to the panel using the four screws supplied with each module.

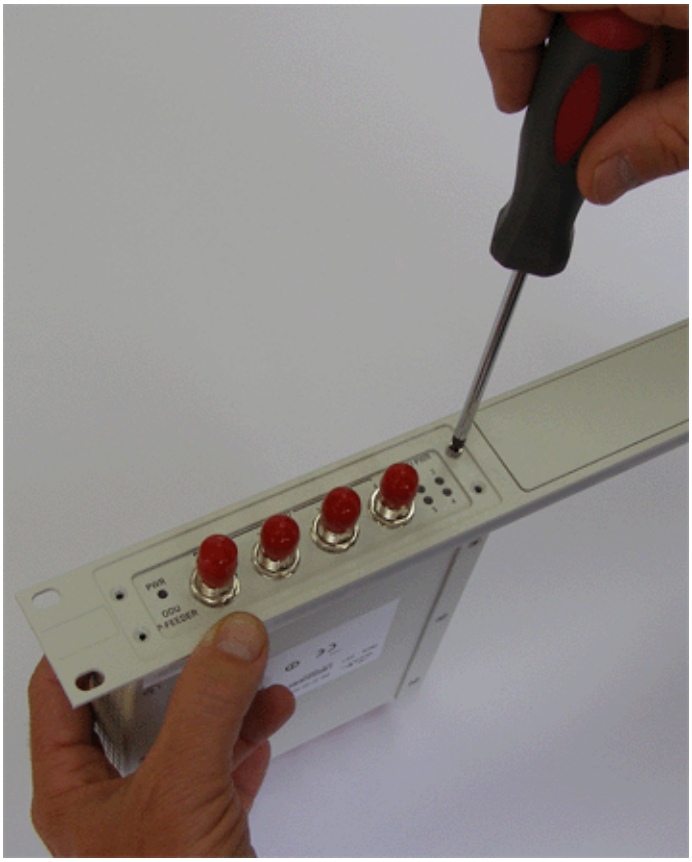


Figure 5-9: Assembling the Power Feeder on a 1U Panel

4 Position the Power Feeder in the desired location in a standard 19" rack. When considering the location in the rack, take into account the cable's length.

5 Tighten 4 screws on either side until the Power Feeder panel is firmly held in the rack.

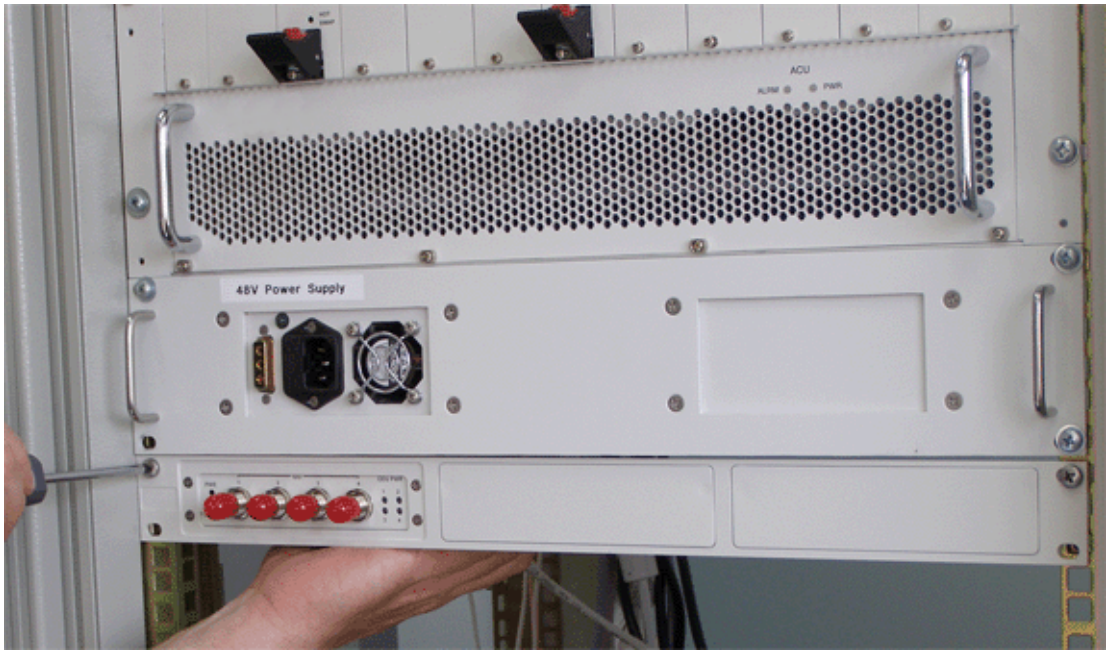


Figure 5-10: Installing the Power Feeder in a 19" Rack

To install the Power Feeder in a 21" rack:

For installation in a 21" cabinet, attach suitable ETSI rack adapters.

5.2 Installing the AU-ODU/AU-ODU-HP

The AU-ODU installation consists of the following steps:

1. On-ground preparation of the AU-ODU/AU-ODU-HP
2. On-ground preparation of the antenna for installation
3. Mounting the AU-ODU/AU-ODU-HP on a pole/tower
4. Mounting the Antenna on a pole/tower.

Before beginning, make sure you have the following items available:

- Any of the following AU-ODUs:

Table 5-1: AU-ODU Types

Item	Description
BMAX-BST-AU-ODU-3.3d	AU-ODU operating in the 3.3d band
BMAX-BST-AU-ODU-3.3e	AU-ODU operating in the 3.3e band
BMAX-BST-AU-ODU-3.3f	AU-ODU operating in the 3.3f band
BMAX-BST-AU-ODU-3.3g	AU-ODU operating in the 3.3g band
BMAX-BST-AU-ODU-3.5a	AU-ODU operating in the 3.5a band
BMAX-BST-AU-ODU-3.5b	AU-ODU operating in the 3.5b band
BMAX-BST-AU-ODU-HP-3.5a	High Power AU-ODU operating in the 3.5a band
BMAX-BST-AU-ODU-HP-3.5b	High Power AU-ODU operating in the 3.5b band
BMAX-BST-AU-ODU-3.6a	AU-ODU operating in the 3.6a band
BMAX-BST-AU-ODU-3.6b	AU-ODU operating in the 3.6b band

- ODU pole mounting kit
- Indoor-Outdoor cable - IF cable with two TNC connectors* (for details on IF cable types and length see Section 3.3).
- Grounding cable with an appropriate termination.
- RF Cable for connecting the antenna to the ODU
- Antenna

- Antenna pole mounting kit
- Installation tools and material (see Section 3.8).

5.2.1 Preparing the AU-ODU/AU-ODU-HP

Prepare the ODU for mounting. Using a flat screwdriver, fasten the four threaded rods (¼" / M8) to the tapings on the back side of the ODU. See Figure 5-13-Figure 5-13.

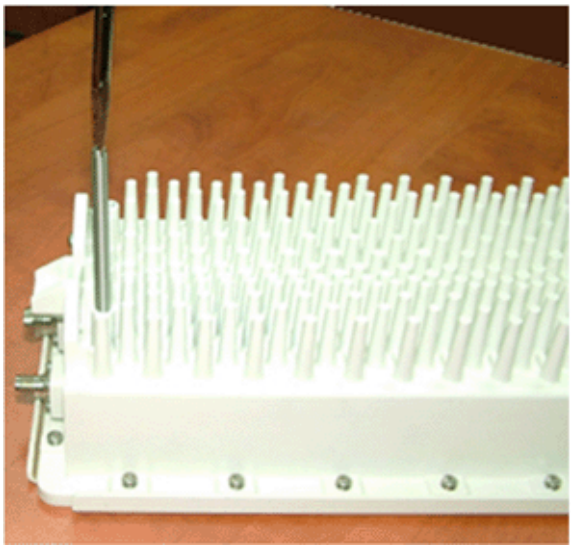


Figure 5-11: Preparing the AU-ODU for Mounting

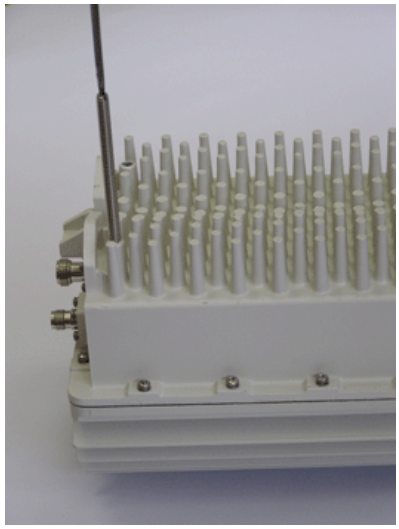


Figure 5-12: Preparing the AU-ODU-HP for Mounting

Figure 5-13: AU-ODU/AU-ODU-HP Ready for Mounting

5.2.2 Preparing the Antenna

Prepare the Antenna for mounting, as follows:

1 Fasten the two main (M8 x 150mm) screws to the Clamp. (MC5021-01), either manually or by using a spanner (no special torque is required). Use a flat washer under the screw's head. See Figure 5-14.

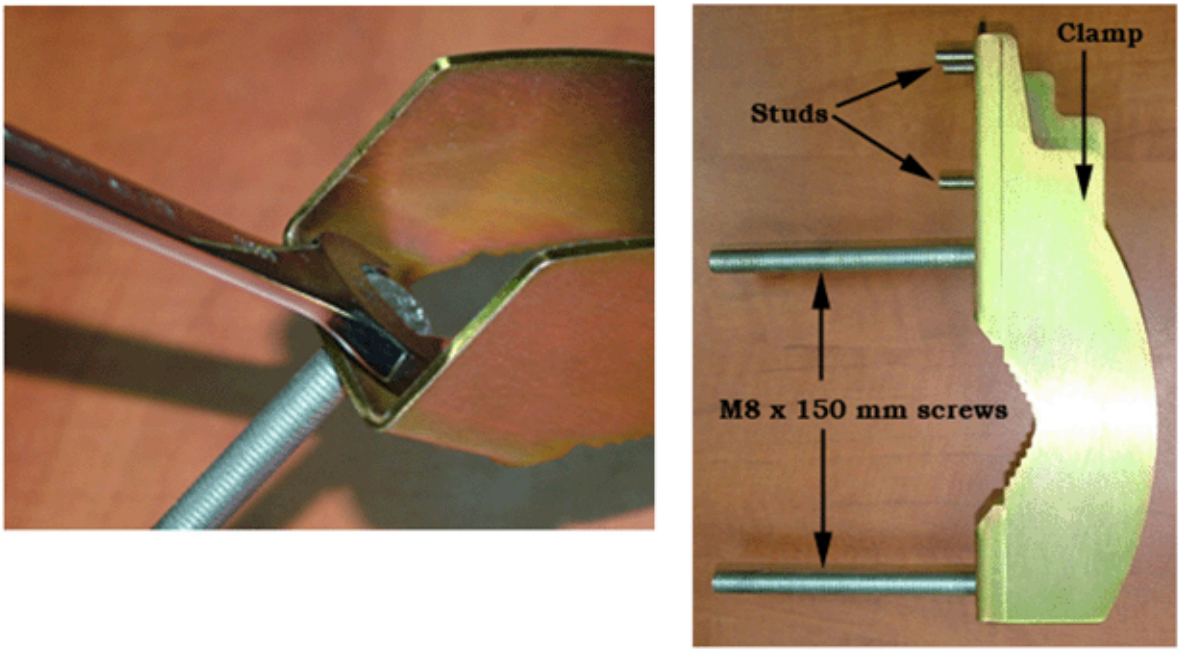


Figure 5-14: Preparing the Clamp

2 Assemble the Holder (MC5022-01) on the 3 studs of the Clamp.

3 Close with the supplied nuts, using the flat and spring washers. Do not tighten yet.

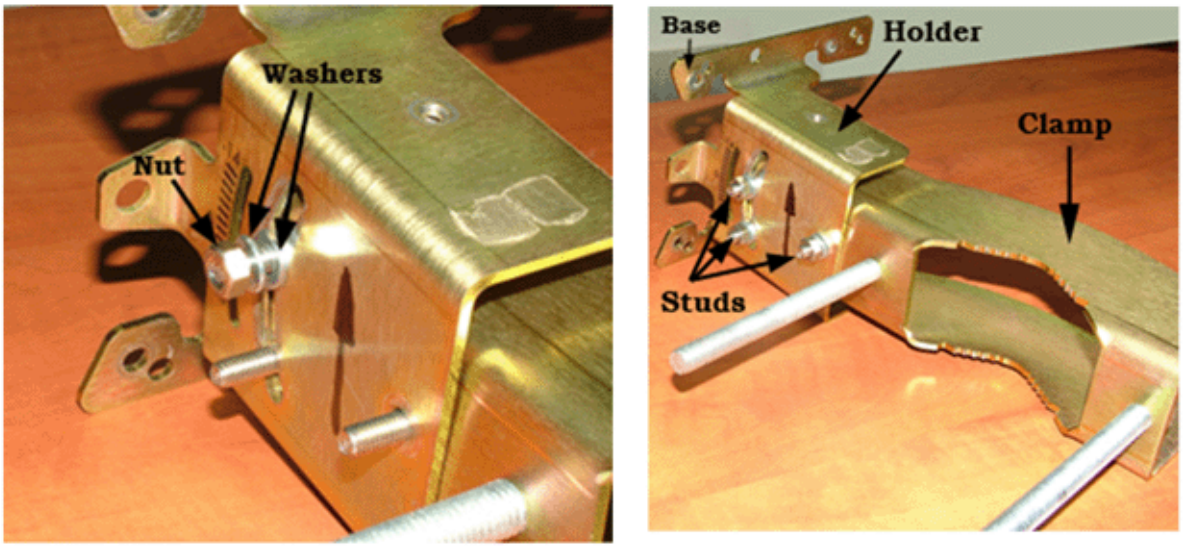


Figure 5-15: Assembling the Holder onto the Clamp

4 Position the base of the Holder on the antenna while aligning the base holes with the antenna studs.

NOTE

The Holder contains several hole patterns supporting diverse antennas (with different studs patterns).

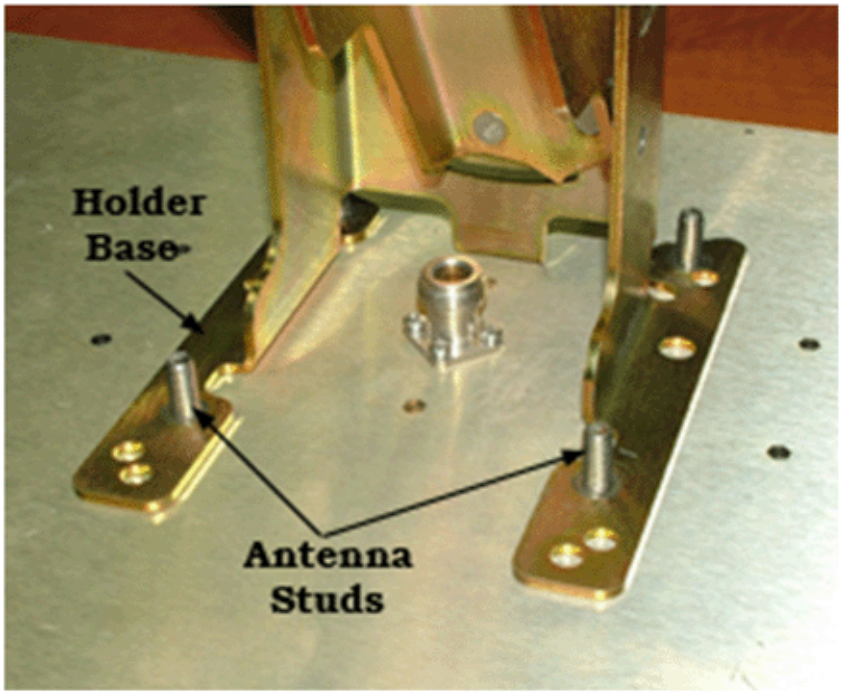


Figure 5-16: Positioning the Holder Base on the Antenna

5 Fasten the four nuts, using the flat and spring washers supplied. Apply torque of 8.5 [N*m] (75 [lbs*in]).

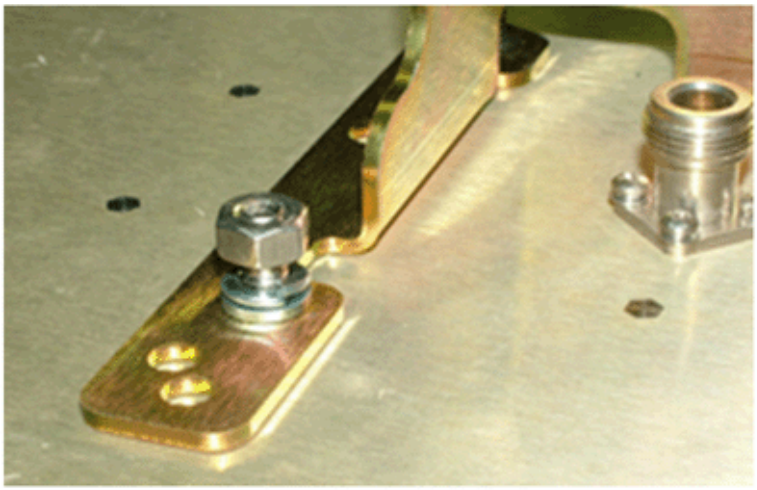


Figure 5-17: Fastening the Holder Base to the Antenna

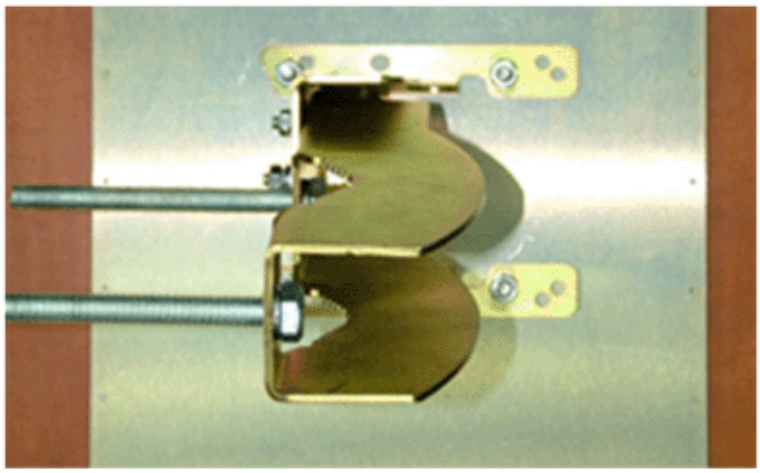


Figure 5-18: Clamp and Holder Fastened on Antenna - Top View

5.2.3 Mounting the AU-ODU/AU-ODU-HP on a Pole Using Clamps

NOTE

The instructions detailed in this section are applicable to both AU-ODU and AU-ODU-HP.
Use clamps to mount the AU-ODU on a pole of up to 4" diameter.

1 Lean the AU-ODU vertically on the pole. Pay attention to the 'UP' arrow on the casing.

For AU-ODU-HP, it is recommended to use a harness to lift the unit and position it on the pole (see Figure 5-19 and Figure 5-20).

Figure 5-19: Lifting the AU-ODU Using a Harness - 1

Figure 5-20: Lifting the AU-ODU Using a Harness - 2

2 Thread the clamp on the two upper studs (concave side toward the pole).

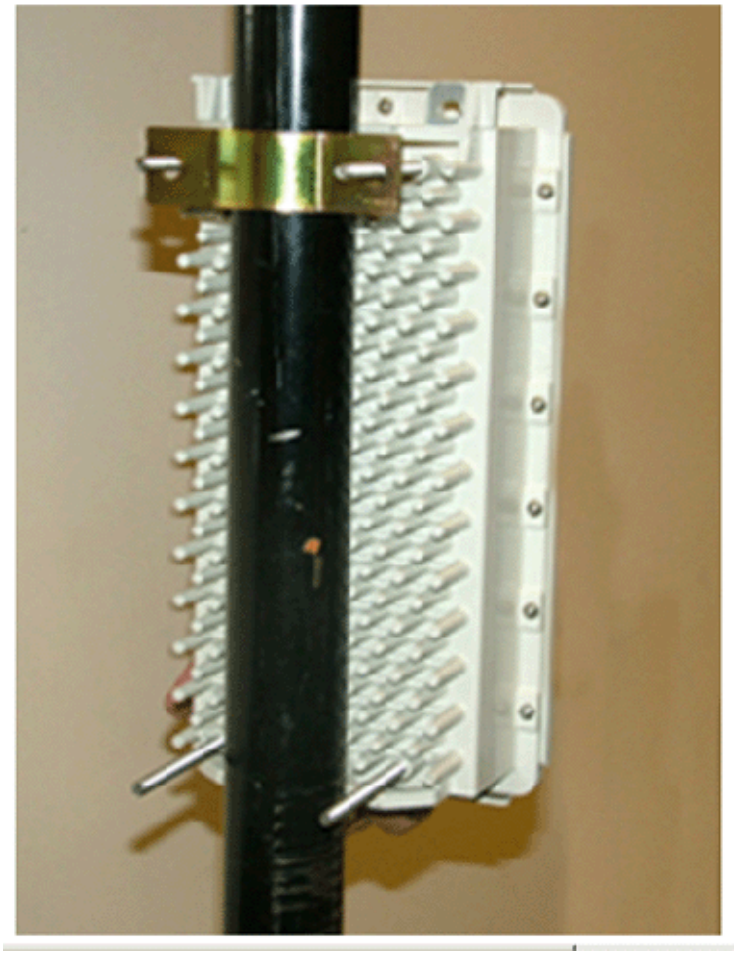


Figure 5-21: Assembling the AU-ODU on a Pole

3 Use two ¼" nuts, washers and spring washers to secure the AU-ODU to the pole. Do not tighten yet.

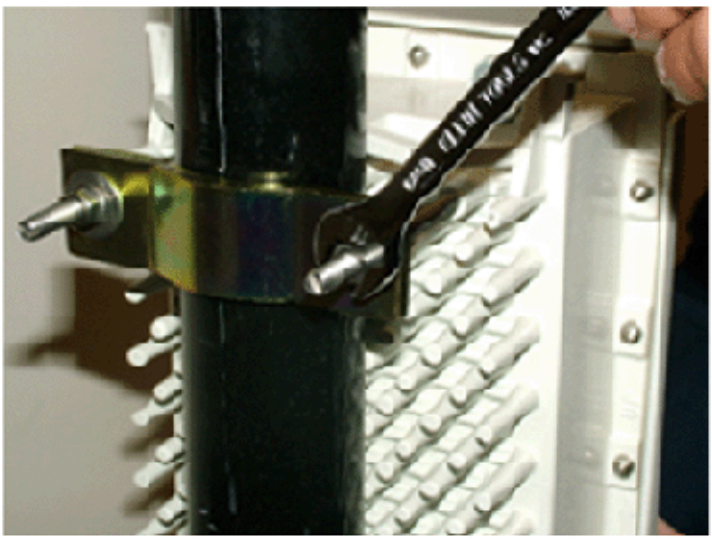


Figure 5-22: Securing the AU-ODU to the Pole

4 Thread the second clamp on the two bottom studs.

5 Use two ¼" nuts, washers and spring washers to secure the AU-ODU to the pole.

6 Fasten the 4 nuts to firmly secure the AU-ODU to the pole. The two pairs of nuts should be fastened equally so that the clamp will remain parallel to the casing. Apply torque of 8.5 [N*m] (75 [lbs*in]).

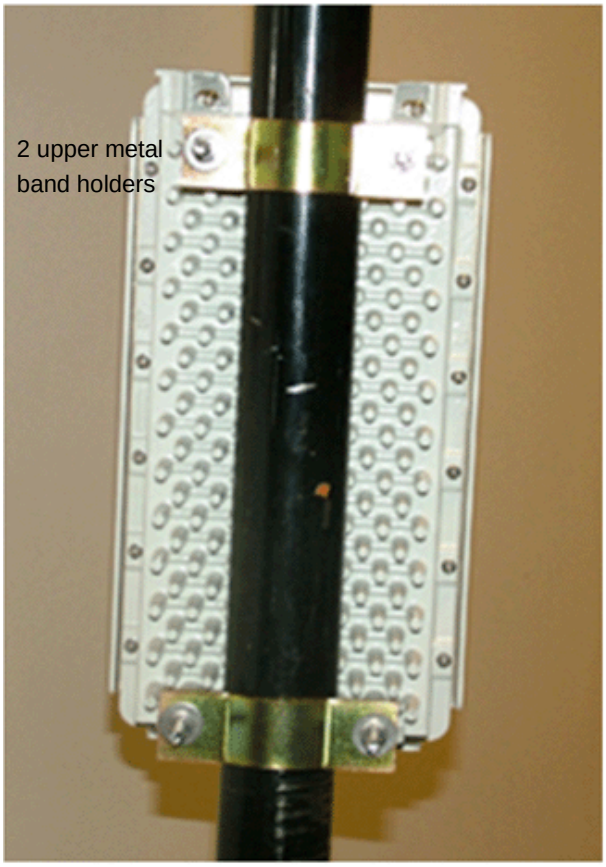


Figure 5-23: AU-ODU Assembled on a Pole

Figure 5-24: AU-ODU-HP Assembled on a Pole

5.2.4 Mounting the AU-ODU/AU-ODU-HP on a Pole Using Metal Bands

IMPORTANT

- For pole sizes up 2 inches, use the pole mounting kit supplied with the ODU's package. The "metal bands" are required for 2"-4" pole size.
- The maximum "metal band" width is 14 mm.

1. Lean the AU-ODU vertically on the pole. Pay attention to the 'UP' arrow on the casing.
2. Mount the metal band on the two upper metal band holders.
3. Secure the AU-ODU to the pole. Do not tighten yet.

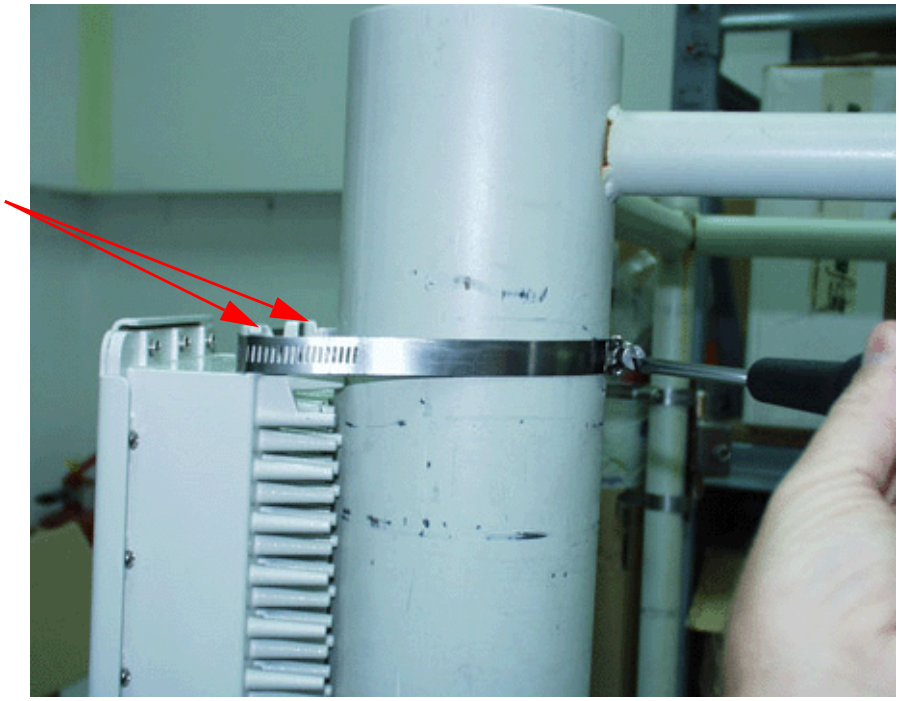


Figure 5-25: Securing the AU-ODU to the Pole - 1

4 Mount and thread the second metal band on the bottom stud.

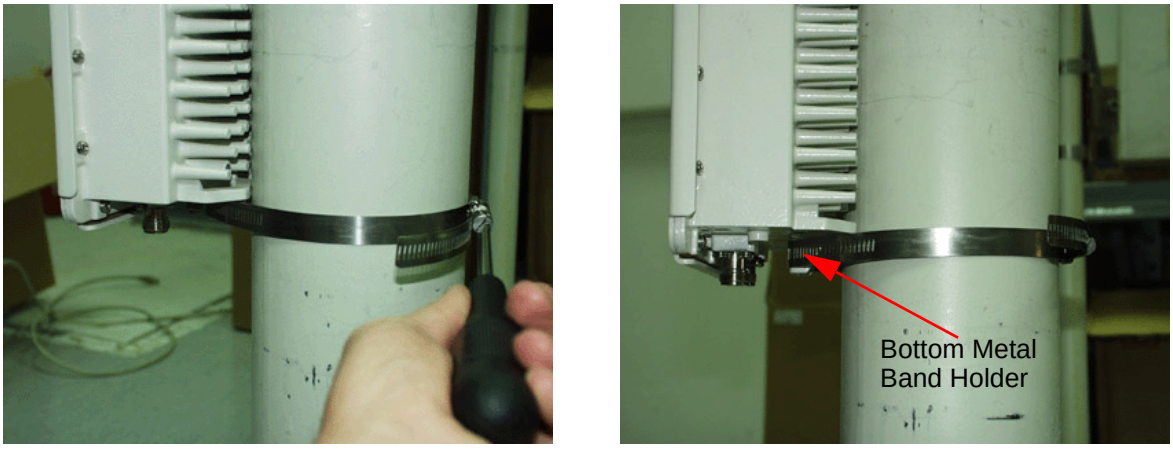


Figure 5-26: Securing the AU-ODU to the Pole - 2

5 Fasten the screw of each one of the metal bands to firmly secure the AU-ODU to the pole.

Figure 5-27: Securing the AU-ODU to the Pole - 3

To connect the Antenna Cable, refer to Section 6.1.

5.2.5 Mounting the Antenna on a Pole

1. Assemble the pole mount on the pole. Use the Rear clamp (MC4465-01)
2. Point the antenna to the desired direction.
3. Fasten the M8 nuts using the flat and spring washers. Apply torque of 14.9 [N*m] (132 [Lbs*in]).

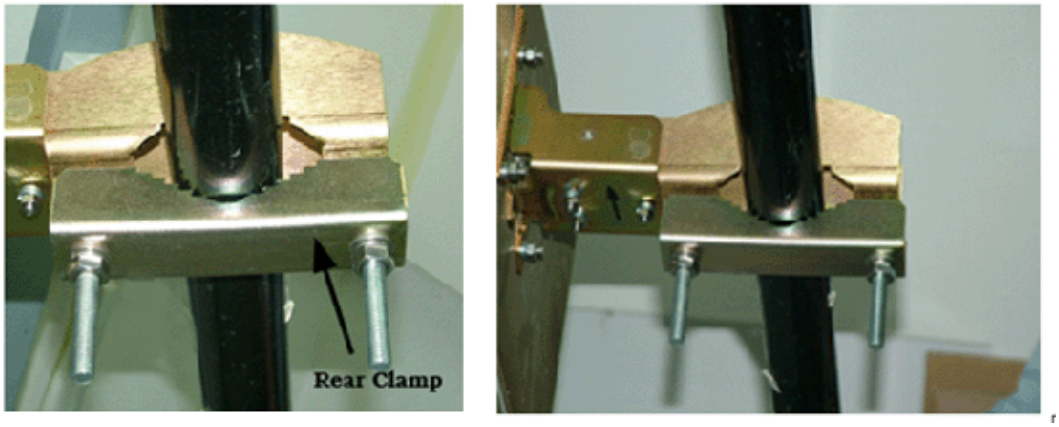


Figure 5-28: Assembling the Pole Mount on the Pole

4 Adjust the desired elevation angle of the antenna. For your convenience, use the angle scale to measure the elevation angle of the antenna.

5 After elevation adjustment is done, fasten the 3 locking elevation (M3) nuts. Use the flat and spring washers. Apply torque of 0.6 [N*m] (5.2 [Lbs*in]).

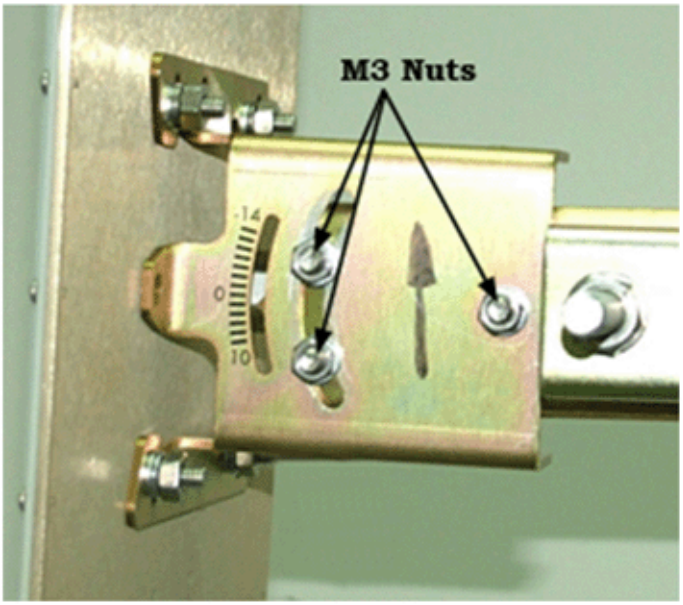


Figure 5-29: Adjusting the Elevation Angle

5.2.6 Mounting the AU-ODU/AU-ODU-HP/Antenna on a Tower

To mount the AU-ODU/Antenna on a tower, you need an adapter to standard pole dimensions. The adapter should be mounted on the tower and the ODU/antenna should be mounted on the adapter. To mount on the adapter, follow the instructions for mounting on a pole. See Section 5.2.3 and Section 5.2.4.

The adapter cannot be ordered from Alvarion.

After mounting the AU-ODU and antenna on a pole/tower, proceed to connecting the cables (Chapter 6).

6

Chapter 6 - Connecting the Cables

In This Chapter:

The pictures are for illustrative purposes only. The actual modules may differ depending on the type used.

IMPORTANT

When spreading the cables on the roof to inside the building, pay attention to the connectors.

For the IF cables, make sure that the N-Type connector side of the cable remains on the roof and that the TNC connector side enters the building.

For the GPS cable, make sure that the 12-pin round connector (female) side of the cable remains on the roof and that the RJ-45 connector side enters the building.

6.1 Connecting the Antenna Cable

To connect the antenna cable:

1 Connect the right angle N-Type male connector to the antenna female connector. Use a spanner to fasten gently. Apply torque of 31 [N*m] 275 [Lbf*in].

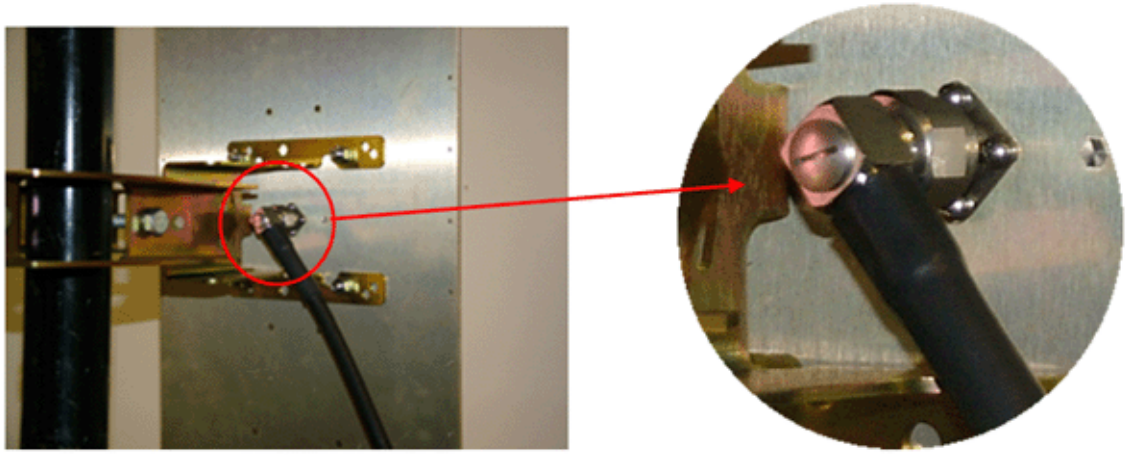


Figure 6-1: Connecting the Antenna Cable to the Antenna

2 Connect the other side of the cable to the N-Type connector of the AU-ODU. Fasten gently. Apply torque of 31 [N*m] 275 [Lbf*in].

Figure 6-2: Connecting the Antenna Cable to the AU-ODU

3 Fix the Antenna cable onto the pole using a cable strip.

   a Use additional cable strips to route the cable such that water can accumulate on the cable bends, away from the unit.

   b When routing the cable, do not exceed the minimum bending radius in the cable specifications

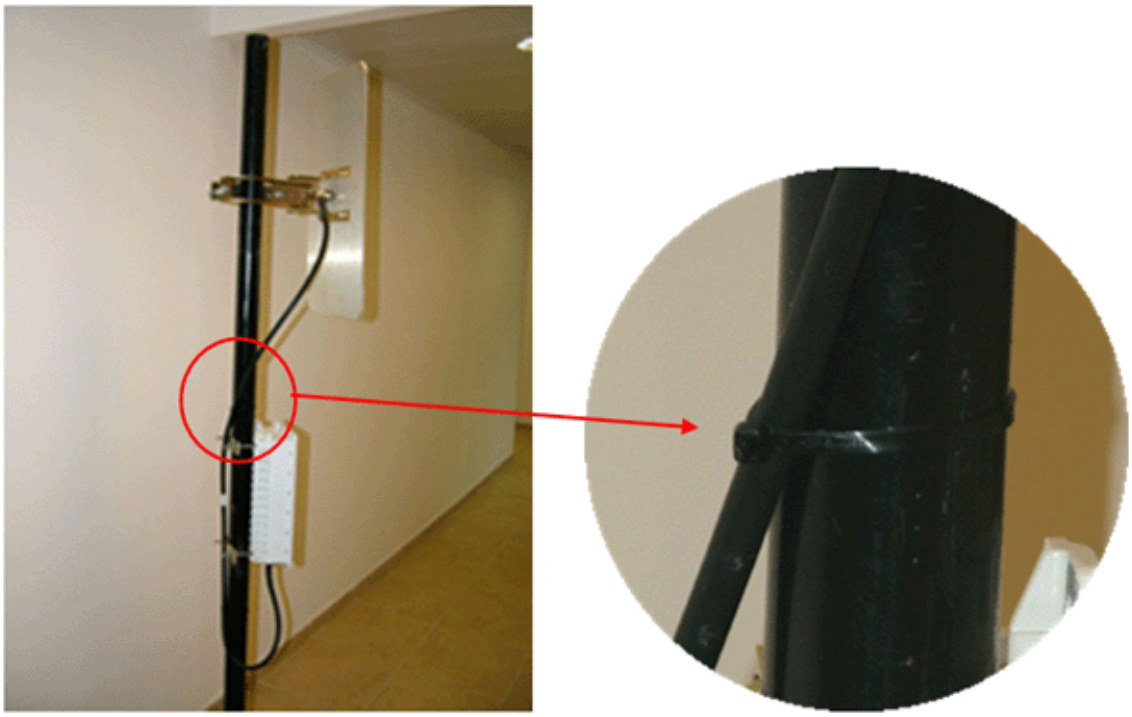


Figure 6-3: Fixing the Antenna Cable onto the Pole

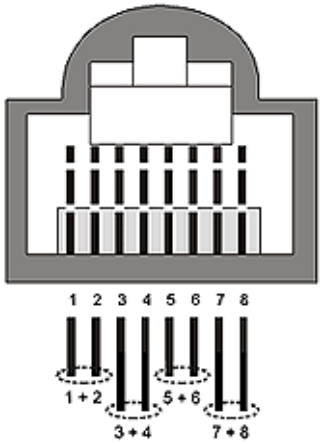
6.2 Preparing the GPS IDU-ODU Cable

The indoor-to-outdoor cable is supplied open-ended at the indoor unit end, to allow the installer to conveniently route it through a hole in the wall. The end that is to be connected to the outdoor unit is supplied with a crimped connector (12-pin waterproof round connector). The cable kit includes also two shielded RJ-45 connectors and a protective cover for the connector.

To prepare the IDU-ODU cable:

1 Assemble an RJ-45 connector with a protective cover on the indoor end of the IDU-ODU cable. Refer to the pin assignment and color codes in standard cables described below.

Wire color	Pin
Orange/white	1
Orange	2
Brown/white	3
Brown	4
Blue	5
Blue/white	6
Green	7
Green/white	8



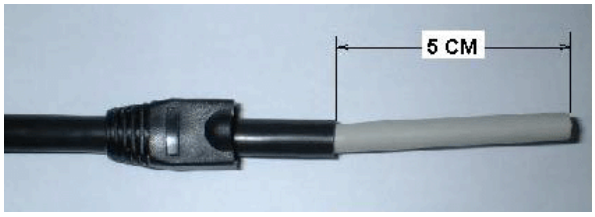
2 Use a standard crimp tool to prepare the wires. Insert them into the appropriate pins of the RJ-45 connector, and use the tool to crimp the connector. The figure below shows the wire pair pin-to-pin connections required for the indoor-to-outdoor cable (see step-by-step instructions on the back of this page). Make sure to pull back the shield drain wire before inserting the cable into the RJ-45 connector, to ensure a good connection with the connector's shield after crimping.

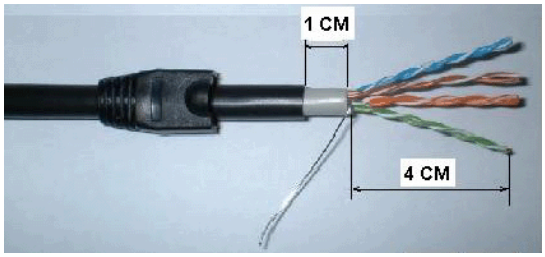
3 Connect the Ethernet cable to the ODU GPS RJ-45 connector located on the rear panel of the GPS Adapter.

To assemble the RJ-45 connector:

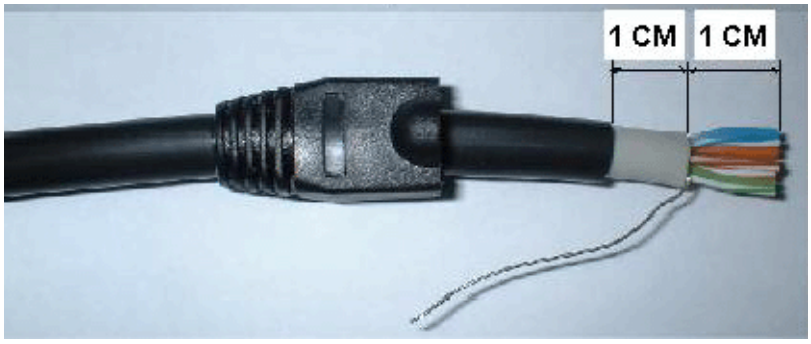
1 Thread the RJ-45 plastic cover on the cable.

2 Reveal 5 cm of outer sleeve, then reveal 4 cm of the inner sleeve.

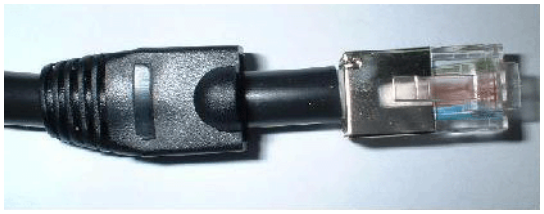




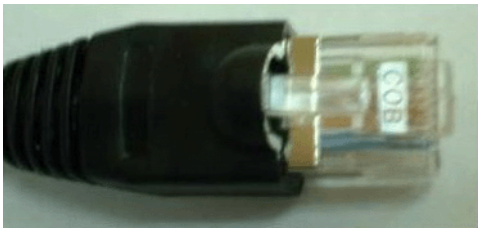
3 Release all wires and arrange them in order, then cut them to 1 cm length.

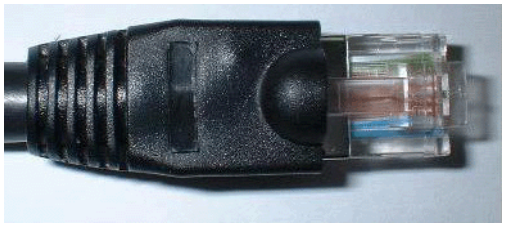


4 Insert the wires into the connector and press it using a standard tool (it is recommended to solder the shield drain wire to the connector as in the picture).



5 Push the plastic cover into place.





6.3 Connecting the AU-ODU IF Cable

The AU-ODU is connected to the AU-IDU via an IF cable carrying both signals and power. For details on the IF cable requirements see Section 3.3. Before connecting the IF cable, make sure that the length of the IF cable is sufficient to reach the AU-IDU. See Table 3-2 for IF Cable length limitation.

To connect the AU-ODU IF cable:

1 Connect the male TNC connector of the IF cable to the female TNC connector on the AU-ODU (IF connector).

Figure 6-4: Connecting the IF Cable

2 Connect the other end of the coaxial IF cable to either the AU-IDU or Micro Base Station, as follows:

- AU-IDU: to the ODU connector at the AU-IDU front panel (see Figure 6-5).
- Micro Base Station: to the ODU connector located on the front panel of the Micro Base Station (see Figure 6-6).

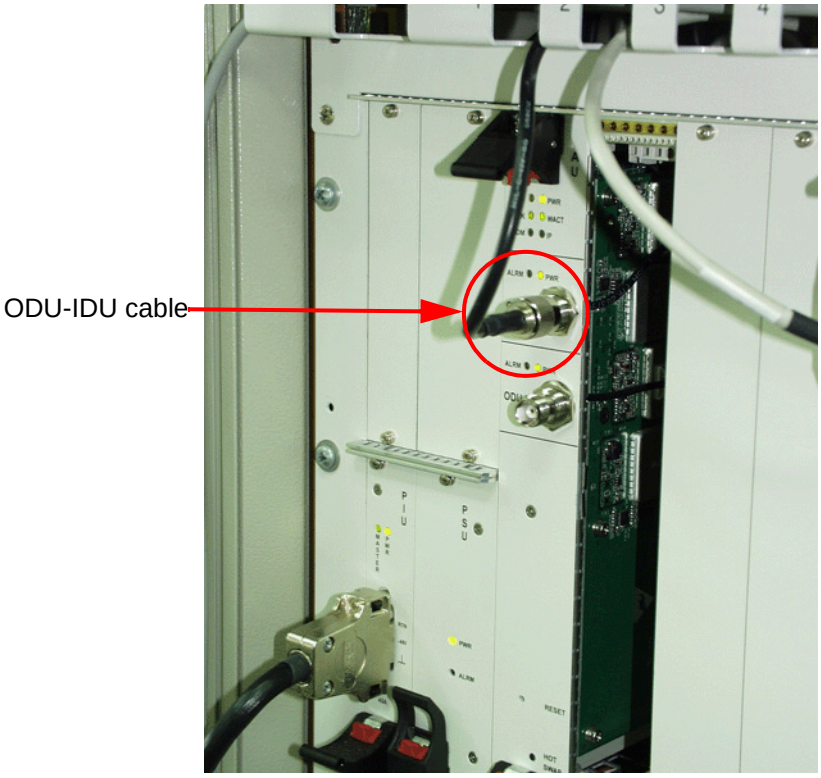


Figure 6-5: Connecting the ODU-IDU Cable - Modular Base Station

Figure 6-6: Connecting the ODU-IDU Cable - Micro Base Station

6.4 Connecting the AU-ODU-HP IF Cable

The AU-ODU-HP is connected to the ODU Power Feeder via an IF cable carrying both signals and power. For details on the IF cable requirements see Section 3.3. Before connecting the IF cable, make sure that the length of the IF cable is sufficient to reach the AU-IDU. See Table 3-2 for IF Cable length limitation.

To connect the AU-ODU-HP IF Cable

1. Connect the male TNC connector of the IF cable to the female TNC connector on the AU-ODU (IF connector). See Figure 6-4.
2. Connect the other end of the coaxial IF cable to the ODU connector on the rear panel of the ODU Power Feeder. To avoid transmissions at undesired frequencies, verify that the frequency and bandwidth parameters are properly configured before connecting the IF cables.

Figure 6-7: Connecting the AU-ODU-HP IF Cable to the ODU Power Feeder

To connect the ODU Power Feeder to the BST

1. Connect one end of the IF cable supplied with the module to the IDU connector(s) on the ODU Power Feeder's front panel.

Figure 6-8: Connecting the ODU Power Feeder IF Cable

2 Connect the other end of the IF cable to the appropriate ODU connector(s) of the AU-IDU(s)/Micro Base Station.

Figure 6-9: Connecting the ODU Power Feeder IF Cable to AU-IDU

Figure 6-10: Connecting the ODU Power Feeder IF Cable to Micro Base Station

6.5 Connecting the Grounding Cable

6.5.1 Grounding Outdoor Units

When grounding Alvarion Outdoor Radio Units, use the GND (ground) screw on the unit as a grounding point.

A 16-mm² cable may not easily attach to the "ground screw". Therefore, it is recommended to crimp a lug onto the end of cable and attach the cable to the same threaded rods that are used as part of the bracket as shown in Figure 6-11.

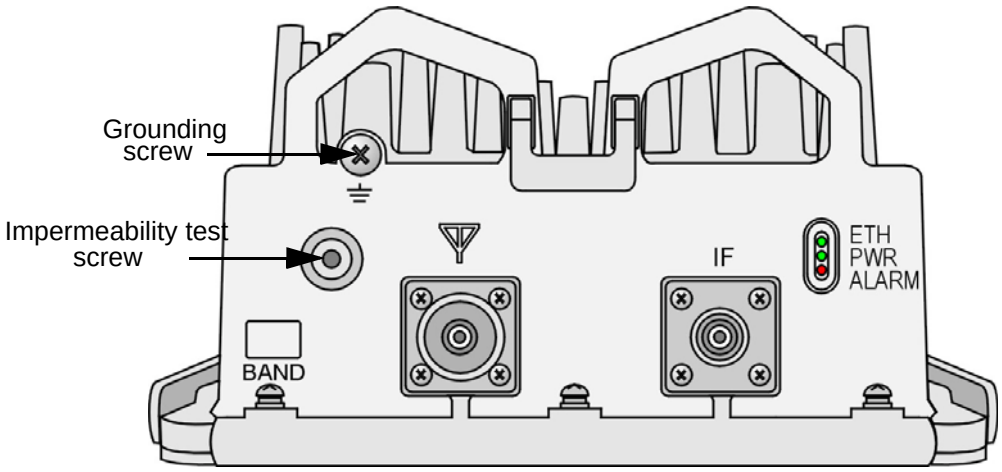


Figure 6-11: BreezeMAX AU-ODU/AU-ODU-HP Grounding Points

CAUTION

Do not open the impermeability test screw - you may impair the unit's sealing against moisture and humidity.

The shield (outside conductor) of the coaxial cable must be connected to the Outdoor Unit chassis ground via the coax connector at the top, and to ground on entering the building/shelter.

NOTE

It is important for the Alvarion IF product line that only the shield of the cable is bonded to the grounding points. As there is a DC current flowing on the center conductor of the cable, any connection to the center conductor would interfere with this DC current.

This includes the insertion of any lightning protection devices.

To connect the grounding cable:

1 Connect the grounding cable to the grounding screw (marked ⏚) located on the bottom panel of the AU-ODU. Use a Philips screwdriver and apply torque of 1.2 [N*m] (10.8 [lbs*in]).

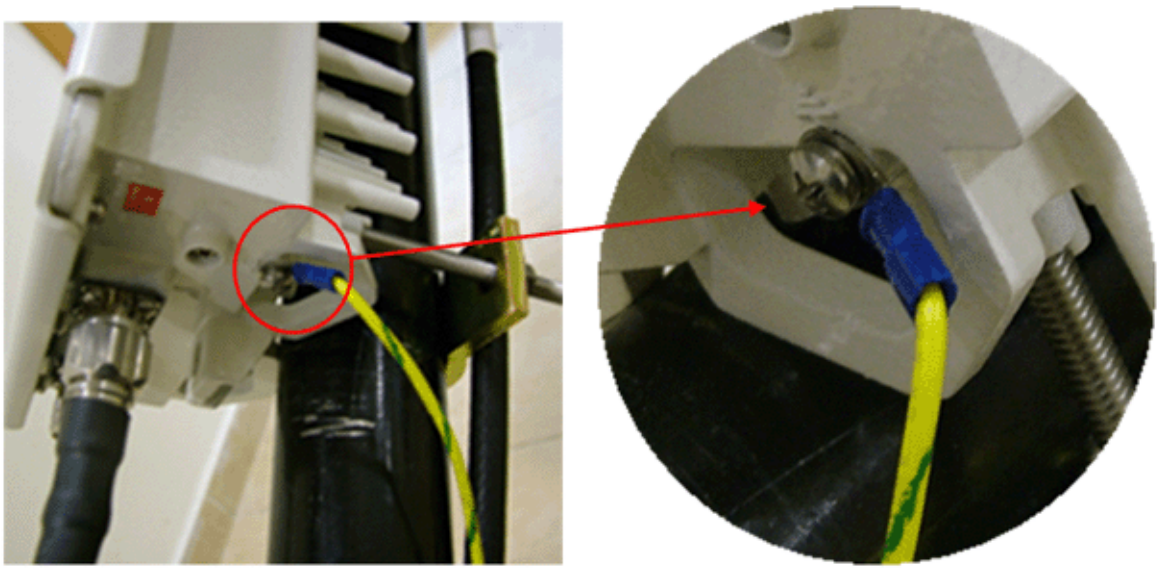


Figure 6-12: Connecting the Grounding Cable to the AU-ODU

NOTE

- Use cable strips in order to attach all cables to the pole.
- Do not pull the cable, avoid stretching it. Leave enough cable length between the strip and the connection on both sides of the cable.

2 Connect the other end of the grounding cable to a good ground (earth) connection.

For information on lightning protection, see Section 2.3.

6.5.2 Grounding Indoor Units

6.5.2.1 Base Station

The Base Station indoor equipment should preferably be connected to the Equipment Earth Grounding Bar (EGB), which is in turn connected to the site ground. In small sites where there is no EGB, grounding of the BST can be

achieved via a grounding screw, inserted at the back of the chassis/Micro Base Station (see Figure 6-11, Figure 6-13 and Figure 6-14). Connect one end of the grounding cable to the ground terminal located on the rear panel and firmly tighten the grounding screw. Connect the opposite end of the grounding cable to a ground connection or to the rack.

A grounding wire connects the chassis to the EGB. Double connection must be avoided in order to eliminate ground loops.

The gauge of the grounding cable must be no less than 18 AWG.

For the GND point connection, use a closed loop terminal crimped to GND wire.

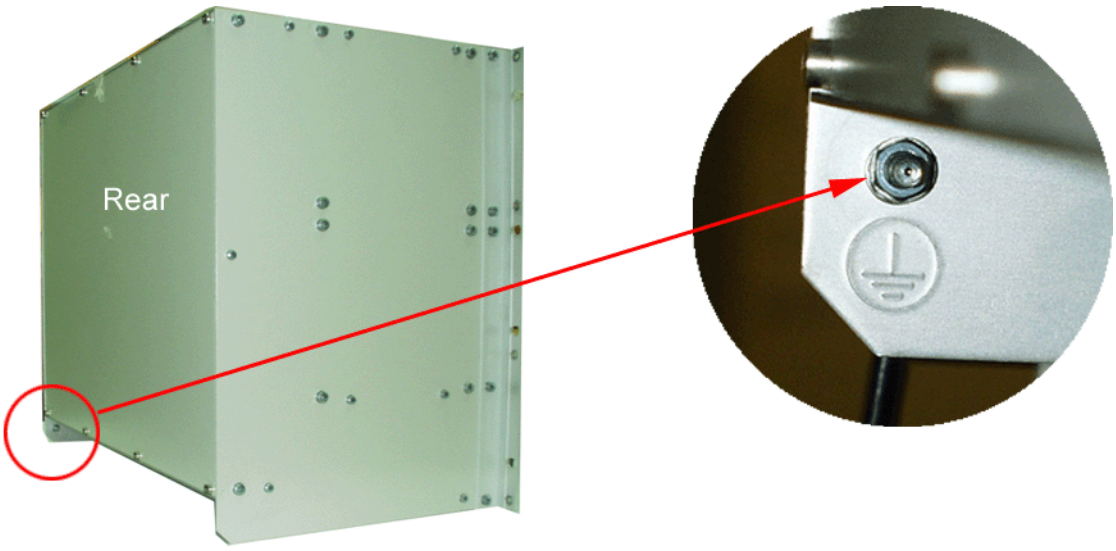


Figure 6-13: BreezeMAX Base Station Chassis - Grounding Screw

Figure 6-14: BreezeMAX Micro Base Station - Grounding Screw

For information on lightning protection, see Section 2.3.

6.5.2.2 ODU Power Feeder

1 Connect one end of a grounding cable to the grounding screw located on the rear panel of each ODU Power Feeder module and firmly tighten the grounding screw.

Figure 6-15: ODU Power Feeder - Grounding Screw

2 Connect the opposite end of the grounding cable(s) to a ground (earth) connection or to the cabinet, if applicable.

6.6 Sealing the Outdoor Connectors

To seal the connectors:

Use isolation material (such as tar bands) to cover all outdoor connectors to prevent water penetration into the cables.

We recommend using 3M's cold shrink tube 8426-9 as a solution for sealing. This solution requires no training or special tools. If you are using the 8426-9 cold shrink, leave a 10 cm space (see) to keep the cable flexible.

Use high quality sealing material such as Scotch® 130C Linerless Rubber Splicing Tape from 3M to ensure IP-67 compliant protection against dust and water.

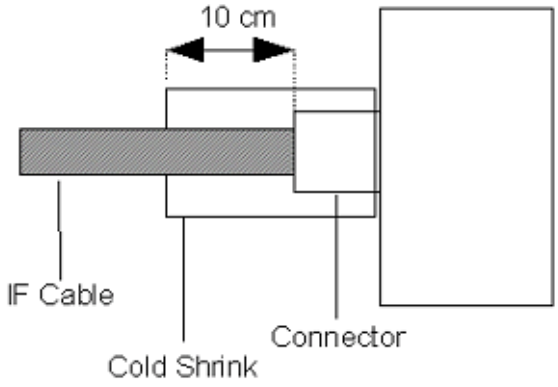


Figure 6-16: Sealing ODU Connectors

NOTE

- The N-Type connectors of the ODU & IDU must be closed without using any tool, only by hand.
- The outdoor connectors should be tightened using sleeves.
- When routing the coaxial cable, leave a service loop at the antenna so there will sufficient length of coaxial cable to replace a faulty connector, when necessary.
- Secure the coaxial cable so that there is no mechanical stress at the antenna connection. Follow the superstructure with the coaxial cable to its base to the building.
- If the coaxial cable requires suspension from the RFU to the building, use a stranded wire to support the coaxial cable weight. (The support will prevent a migration of the coaxial cable's inner conductor to the shield).

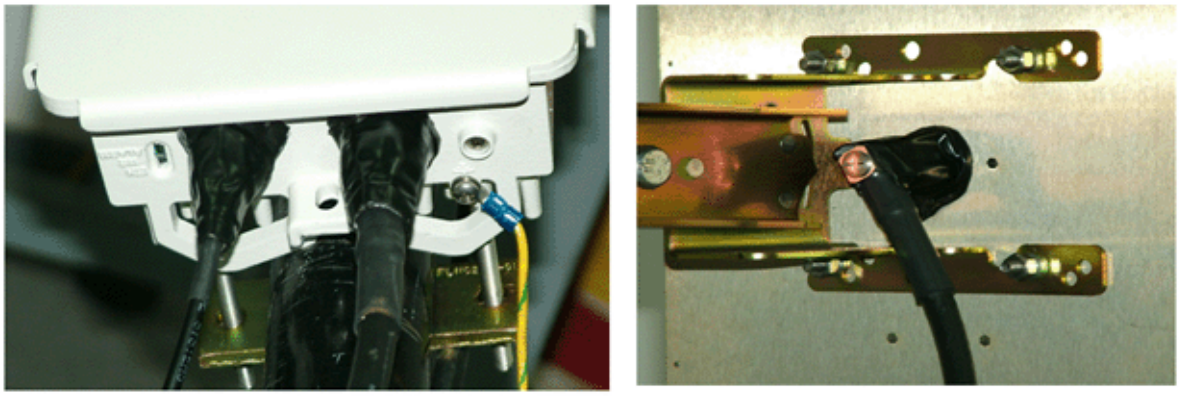


Figure 6-17: Sealed Connectors

7

Chapter 7 - Connecting to Power

In This Chapter:

7.1 Preparing a Power Cable

7.1.1 For the Regular (35A) PIU

A 2.5m DC power cable is supplied with each PIU. Additional DC cables can be ordered from Alvarion. If necessary, use the following instructions to prepare a DC cable.

To prepare the power cable:

1 For a Modular Base Station, use a cable capable of supporting a current of at least 40A. Use a cable with 2 x 8AWG (or thicker) wires for the power, plus an additional 8AWG to 20AWG ground wire.

   For a Micro Base Station and ODU Power Feeder, use a cable capable of supporting a current of at least 10A. Use a cable with 2 x 10AWG (or thicker) wires for the power, plus and additional 10AWG to 20AWG ground wire.

2 The matching power connector to be used is Amphenol D-type power P/N 177TWA/3W3/SP3Y with high power socket contacts P/N 17DM53744-1.

3 Connect the cable to the power connector as follows:

   - Pin 1 (RTN): Red (8 AWG/10 AWG min wire)
   - Pin 2 (-48V): Black (8 AWG/10 AWG min wire)
   - Pin 3 (⏚): Ground (shield) (8AWG/10AWG-20AWG wire)

4 Attach suitable terminal rings to the side that connects to the power source.

Figure 7-1 shows the assembly drawing of the power cable.

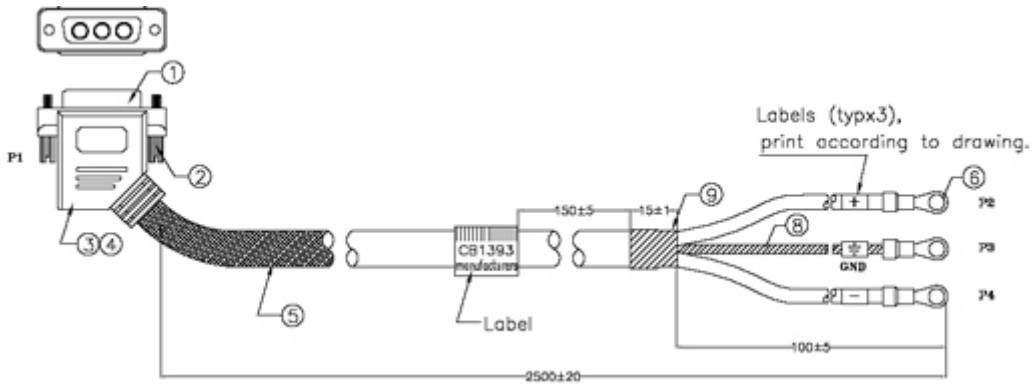


Figure 7-1: Power Cable

Table 7-1: Power Cable Components

Item	Qty	P/N	Description
1	1	CPW3W003F01D001	Power pin 3W3 female, contact: Gold Flash, with 40A MIN. Shell: Nickel plated, Insulator: Black
2	2	MSM3D00210ND001	4-40, Metal Thumbscrew, L=21mm
3	1	SFC30D001	Copper foil 360º Soldered
4		PVMD40PBK01D1	Molded PVC, UL 94V-0, Color: Black
5	1	W64ABK0D2XXXXO2	2C*8AWG + Drain + Braid, Raychem Jacket RFPETM-12-0 or equivalent
6	3	192210225	BCL-8516-PL Copper Terminal Eyelet Style #8
8	1	ST020D001	Heat Shrink Tubing
9	1	ST095D001	Heat Shrink Tubing

7.1.2 For the High-Power (58A) PIU

A 2.5m DC power cable is supplied with each chassis. Additional DC cables can be ordered from Alvarion. If necessary, use the following instruction to prepare a DC cable.

To prepare the power cable:

1 For a cable length up to 2.5m use a cable with 4 x 10AWG (or thicker) wires for the power plus and an additional 10AWG (or tghicker) ground wire. For a

longer cable (up to 10m), use a cable with 4 x 8AWG (or thicker) wires for the power plus and an additional 10AWG (or tghicker) ground wire.

2 The matching power connector to be used is D-SUB 5W5S Female with power pins 40A.

3 Connect the cable to the power connector as follows:

- Pin 1 (RTN): Red (10/8 AWG min wire)
- Pin 2 (-48V): Black (10/8 AWG min wire)
- Pin 3 (⏚): Ground (shield), Green/Yellow (10AWG min wire)
- Pin 4 (-48V): Black (10/8 AWG min wire)
- Pin 1 (RTN): Red (10/8 AWG min wire)

4 Attach suitable terminal rings to the side that connects to the power source.

CAUTION

It is strongly recommended to always use the power cables available from Alvarion.

Due to the high current that should be supported by the cable, good workmanship in preparing it is essential.

Figure 7-2 shows the assembly drawing of the power cable.

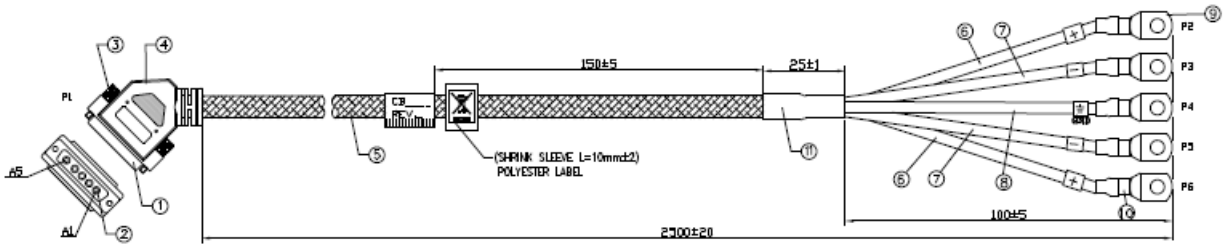


Figure 7-2: Power Cable

7.2 Connecting the Power Cable

7.2.1 Modular Base Station

To connect the power cable:

1 Connect one end of the power cable (with the terminal rings) to the DC power source.

CAUTION

Before connecting the cable to the PIU, use a Voltmeter to check that the voltage and polarization is -48 VDC.

2 Connect the other end of the power cable (with the connector) to the PIU.

When two PIUs are used, the power voltage to the master PIU must be at least 1.5V higher that the power voltage to the slave PIU.

7.2.2 Micro Base Station

7.2.2.1 AC Model

To connect the power cable:

1 Connect one end of the power cable (with the terminal rings) to the AC mains.

2 Connect the other end of the power cable (with the connector) to the AC socket, located on the rear panel.

NOTE

The unit can operate with AC mains of 100-240 VAC, 50-60 Hz.

7.2.2.2 DC Model

To connect the power cable:

1 Connect one end of the power cable (with the terminal rings) to the DC power source.

CAUTION

Before connecting the cable to the Micro Base Station, use a Voltmeter to check that the voltage and polarization is -48 VDC.

2 Connect the other end of the power cable (with the connector) to the DC socket, located on the rear panel.

7.2.3 ODU Power Feeder

To connect the power cable:

1 Connect the power cord to the ODU Power Feeder's DC socket, located on the rear panel.

2 Tighten the cable's screws using a flat head screwdriver.

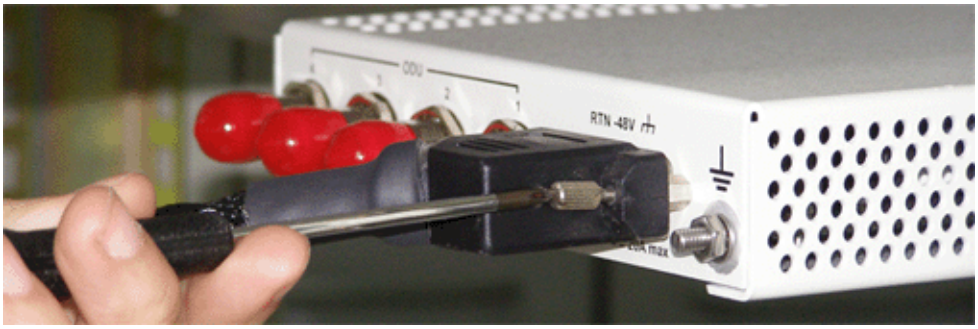


Figure 7-3: Connecting the Power Cable

3 Connect the other end of the power cord to the -48 VDC power source.

8

Chapter 8 - Connecting to the Network and NMS

In This Chapter:

The pictures are for illustrative purposes only. The actual modules may differ depending on the type used.

8.1 Connecting to the Network

Connection to the network is done via the Data port connector on the NPU/Micro Base Station.

To connect to the network:

1. Use a Category 5E Ethernet cable, straight (8-wire, 24 AWG), STP (Shielded Twisted Pair)
2. Connect one end of the cable to the Network/Backbone Devices (router/switch/hub).

NOTE

The Network Device must be 100/1000 Mbps, full duplex.

3. Connect the other end of the cable to the Data Port on the NPU/Micro Base Station. Verify proper operation via the upper (orange) LED indication on the 100/1000Base-T (RJ-45) connector with 2 embedded LEDs, and check LED indicators on the backbone devices as well.

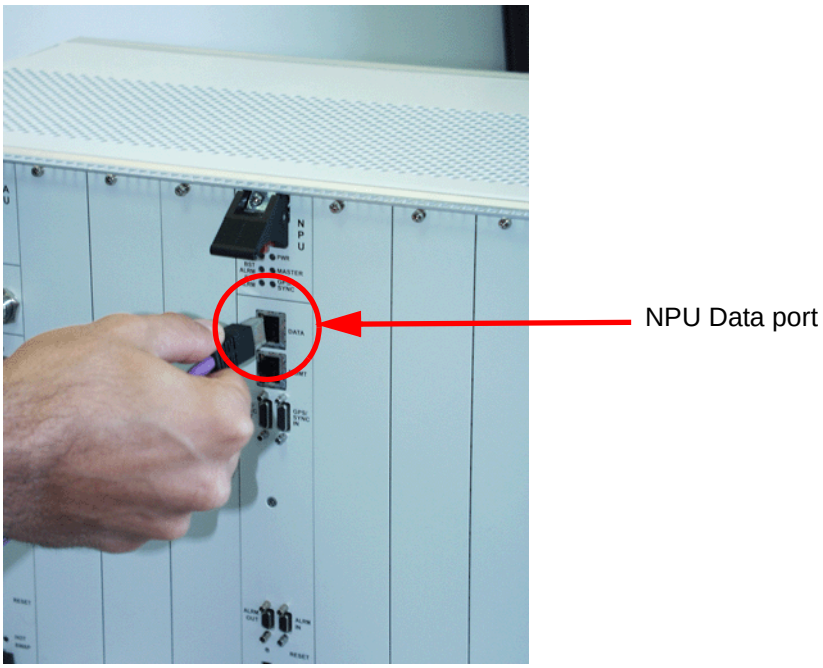


Figure 8-1: Connecting to the Network - Modular Base Station

Figure 8-2: Connecting to the Network - Micro Base Station

4 Configure the Data port to the appropriate Data rate (100/1000 Mbps). See Section 10.3.2.

8.2 Connection for Management Purposes

8.2.1 In Band (IB) Management

IB management is done via the Data port using SNMP or Telnet.

1 Use a category 5E Ethernet cable, (8-wire, 24 AWG), STP (Shielded Twisted Pair) as follows:

- Cross Cable - when connected directly to a PC
- Straight Cable - when connected to a Hub/Switch

2 Connect one end of the cable to the switch/hub/PC.

8.2.2 Out Of Band (OOB) Management

OOB management is done via the Management port or Monitor port of the NPU/Micro Base Station using SNMP or Telnet. For details on connecting via the Monitor port, refer to Section 10.2.1.

IMPORTANT

It is highly recommended to use the Management port for local management purposes only.

1 Use a category 5E Ethernet cable, (8-wire, 24 AWG), STP (Shielded Twisted Pair) as follows:

- Cross Cable - when connected directly to a PC
- Straight Cable - when connected to a Hub/Switch

The Ethernet interface of the MGMT port in the NPU/Micro Base Station operates using Auto Negotiation, enabling communication at either 10 Mbps or 100 Mbps.

2 Connect one end of the cable to the switch/hub/PC.

NOTE

Use Auto Negotiation on the switch/hub/PC when connecting to the Management port.

3 Connect the other end of the cable to the MGMT port of the NPU/Micro Base Station. Verify proper operation via the upper (orange) LED indication on the

100/1000Base-T (RJ-45) connector with 2 embedded LEDs. Check LED indicators on the switch/hub/PC as well.

4 Configure the MGMT port parameters. See Section 10.3.1.

NOTE

Authorized Manager(s) must be configured properly to enable remote management using AlvariSTAR (or other SNMP based applications). See Section 10.3.3.

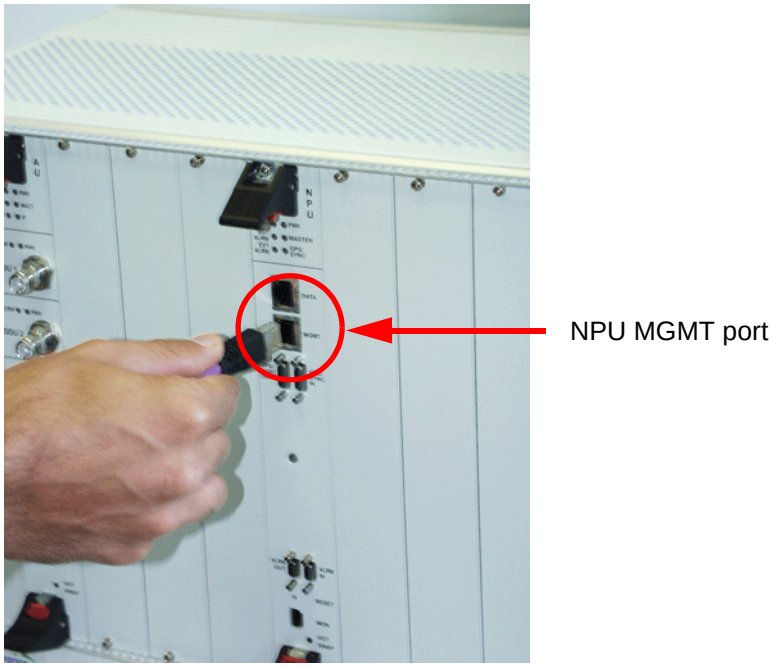


Figure 8-3: Connecting to the NPU Management Port

Figure 8-4: Connecting to the Micro Base Station Management Port

9

Chapter 9 - Power Up Test Procedure (Pre-Commissioning)

In This Chapter:

9.1 General

The power-up tests procedure assumes that the Installation procedure has been completed. These tests demonstrate that the Base Station has been correctly assembled and installed on site, all its components are functioning properly and it is now ready for commissioning.

After the power-up procedure has completed successfully, the Base Station is ready for basic network definition.

9.2 System Initial Verification

Verify that the Base Station/µBST is connected to an AC power source (or also DC power source for µBST, depending on the µBST model) as described in Chapter 7. After power up, the Base Station/µBST automatically starts a self-testing procedure to verify that everything is working properly. During the self-test, the LEDs indicate the working status of the various components. See Section 1.5.12.

Upon completion of the internal test and booting up (up to 5 minutes), verify that the following LEDs are lit as follows:

- Modular Base Station:
  - PIU: PWR = green. If one PIU is installed, MASTER = green. If two PIU modules are installed, the MASTER LED of one PIU should be green, and the other one should be off.
  - PSU: PWR = green, ALRM = off.
  - AVU: PWR = green, ALRM = off.
  - NPU: PWR = green, ALRM = off, BST ALRM = off, Master = green
  - AU-IDU: PWR = green, ALARM = off. ODU1 PWR = green, ODU1 ALRM = off.

  If the AVU's LED is Red, disconnect the power immediately to avoid damage to the Base Station.

- Micro Base Station:
  - PWR = Green, ALRM = off

- Power Feeder (when using AU-ODU-HP)
  - PWR = Green

If any of the above LEDs is red, refer to the Troubleshooting section.

10

Chapter 10 - Commissioning Procedure

In This Chapter:

10.1 General

After completing the installation process and upon successful power-up, as described in the preceding chapters, some basic parameters must be configured using the Monitor application via the MON port of the NPU/Micro Base Station. These parameters are necessary to enable remote management using SNMP or Telnet.

10.2 Accessing the Monitor Program

10.2.1 Connecting via the MON Connector

To access the Monitor Program via the MON connector:

1 To define the system for the first time, use the Monitor cable to connect the MON connector of the NPU/Micro Base Station to the serial COM port of your PC (see Figure 10-1). The COM port connector of the Monitor cable is a 9-pin D-type plug [female].

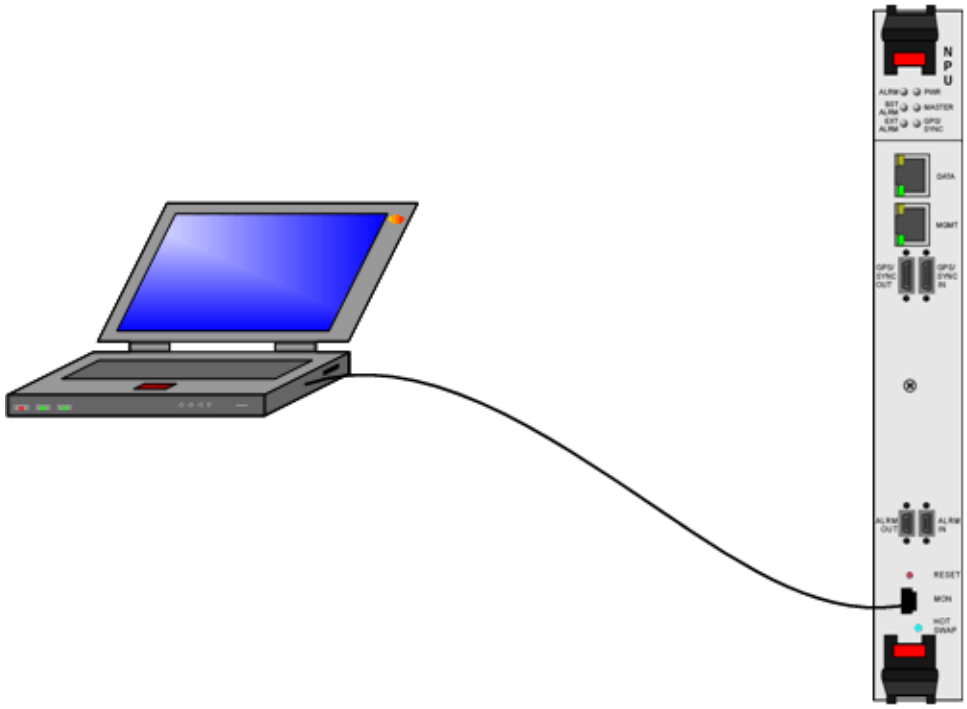


Figure 10-1: Connecting to the NPU

Figure 10-2: Connecting to the Micro Base Station

2 Run a terminal emulation program, such as "Hyper Terminal™", as follows:

Start > *Programs* > *Accessories* > *Communications* > *Hyper Terminal*

3 Set the communication parameters as follows:

Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	None
Flow Control:	Xon/Xoff
Port:	Connected COM port

4 After the Hyper Terminal is defined, activate the connection to the BreezeMAX platform. The BreezeMAX entry screen is displayed.

5 Enter the password. The default password is admin (case sensitive). Upon successful connection, the following main menu is displayed:

```
BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
Main Menu
=========
1 - Base Station
2 - NPU
3 - Radio Cluster
4 - ODU
5 - AU
6 - SU
7 - Services
X - Exit
>
```

Figure 10-3: BreezeMAX NPU Main Menu

```
BreezeMAX/uBST 10.0.6.110
SW Version 2.0.1.25
Main Menu
=========
1 - Micro Base Station
2 - Radio Cluster
3 - ODU
4 - Access Parameters
5 - SU
6 - Services
X - Exit
>
```

Figure 10-4: BreezeMAX Micro Base Station Main Menu

10.2.2 Connecting via Telnet

To access the Monitor program via Telnet:

1. The PC used for accessing the Monitor program should be configured according to the parameters configured for the applicable port in the NPU/Micro Base Station (MGMT or DATA port).
2. Connect a PC to the DATA/MGMT port of the NPU/Micro Base Station using a crossed Ethernet cable.
3. Run the Telnet program connecting to the IP address of the connected port. The Enter the password message is displayed.
4. Enter the password and press the Enter key to get to the BreezeMAX Main Menu (see Figure 10-3 and Figure 10-4).

NOTE

If you forgot the password, type "help" to receive a challenge string consisting of 24 characters. Contact Customer Service and provide the challenge string (after user identification) to receive a temporary password. You can use this password only once to enter the program. The password must be changed during the session to a different "permanent" password. The administrator should be notified of this new password. Five consecutive errors in entering the temporary password will invalidate it. In this case, repeat this procedure to receive a new challenge string for a new temporary password.

10.3 Base Station Commissioning

This section covers the definitions required for enabling communication with and remote management of the BreezeMAX Base Station. Prior to entering the definitions, verify that the Data & Management networks are connected to NPU/Micro Base Station ports (see Chapter 7 and Chapter 8).

NOTE

The Management port must be connected to a separate network from the Data Port using a different Router.

The following diagram shows an example of such a connection.

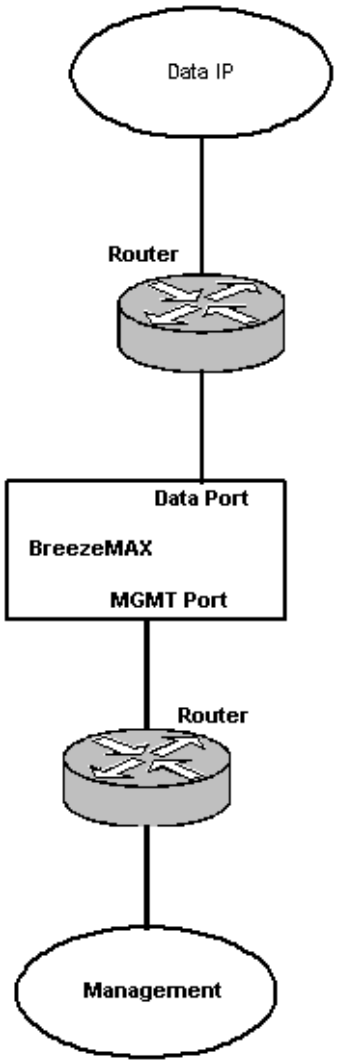


Figure 10-5: Data and Management Connection

10.3.1 Management Port Definition

The following procedure describes the necessary steps for the basic configuration of the BreezeMAX Base Station. The screens have been divided for convenience. In each screen, the required action and the new information displayed as a result of that action appear in black, whereas information already described appears in gray. On the actual screen all of the information appears continuously.

10.3.1.1 Modular Base Station

1 In the BreezeMAX Main Menu screen (Figure 10-3), select option 2 - NPU to enter the NPU menu.

2 Select 3 - Configuration to enter the NPU Configuration menu.

```
BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
Main Menu
=========
1 - Base Station
2 - NPU
3 - Radio Cluster
4 - ODU
5 - AU
6 - SU
7 - Services
X - Exit
>2

BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
NPU
===
1 - Show
2 - Unit Control
3 - Configuration
4 - Performance Monitoring
>
```

Figure 10-6: NPU Menu

```
BreezeMAX/NPU 10.0.22.251
SW Version 4.0.1.9
Main Menu
=========
1 - Base Station
2 - NPU
3 - Radio Cluster
4 - ODU
5 - AU
6 - SU
7 - Services
X - Exit
>2

BreezeMAX/NPU 10.0.22.251
SW Version 4.0.1.9
NPU
===
1 - Show
2 - Unit Control
3 - Configuration
4 - Performance Monitoring
>
```

Figure 10-7: NPU Menu

```
BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
NPU
===
1 - Show
2 - Unit Control
3 - Configuration
4 - Performance Monitoring
>3

BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
NPU-Configuration
=================
1 - Management Port
2 - Data Port
3 - Authorized Managers
4 - Bridge
5 - Voice
>
```

Figure 10-8: Configuration Menu

3 Select option 1 - Management Port. A list of parameters is displayed. These parameters define the IP parameters for the MGMT port, necessary to communicate with the operator Management network and NOC or AlvariSTAR platforms.

```
BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
NPU-Configuration
=================
1 - Management Port
2 - Data Port
3 - Authorized Managers
4 - Bridge
5 - Voice
>1

BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
NPU-Configuration-Management Port
=================================
1 - Management Port IP Address
2 - Management Port Subnet Mask
3 - Management Port Gateway
4 - Management Port Destination Subnet
5 - Management Port Destination Subnet Mask
4 - Management Port Management Traffic Enable/disable
>
```

Figure 10-9: Management Port Menu

4 Set the following parameters:

- Management Port IP Address: The default is 10.0.0.1.

- Management Port Subnet Mask: The default is 255.255.255.0.
- Select 3 (Management Port Gateway) to configure the static route parameters that will be displayed one after the other. These include:
  - Management Port Gateway: The default is 0.0.0.0.
  - Management Port Destination Subnet: The default is 0.0.0.0.
  - Management Port Destination Subnet Mask: The default is 0.0.0.0.
- Management Port Management Traffic Enable/Disable

NOTE

The Management Port Gateway, Destination Subnet and Destination Subnet Mask are grouped together. Exiting the configuration process (e.g. by pressing the Esc button) after configuring just the first one or two parameters in this group will cancel the changes made.

The subnet that is used as the Static Route for remote management via the Management port (defined by the Management Port Destination Subnet and Management Port Dest Subnet Mask parameters), must differ from the local subnet of the Management port (defined by the Management Port IP Address and Management Port Subnet Mask parameters) and from the local subnet of the Data port (defined by the Data Port IP Address and Data Port Subnet Mask parameters).

10.3.1.2 Micro Base Station

To configure the Management Port:

1 In the BreezeMAX Main Menu screen (Figure 10-4), select option 1 - Micro Base Station to enter the Micro Base Station menu.

```
BreezeMAX/uBST 10.0.6.110
SW Version 2.0.1.25
Main Menu
=========
1 - Micro Base Station
2 - Radio Cluster
3 - ODU
4 - Access Parameters
5 - SU
6 - Services
X - Exit
>1

BreezeMAX/uBST 10.0.6.110
SW Version 2.0.1.25
Micro Base Station
==================
1 - Show
2 - Unit Control
3 - Configuration
4 - Alarms and Traps
5 - Performance Monitoring
>
```

Figure 10-10: Micro Base Station Menu

2 Select 3 - Configuration to enter the Micro Base Station Configuration menu.

```
BreezeMAX/uBST 10.0.6.110
SW Version 2.0.1.252
Micro Base Station
==================
1 - Show
2 - Unit Control
3 - Configuration
4 - Alarms and Traps
5 - Performance Monitoring
>3

BreezeMAX/uBST 10.0.6.110
SW Version 2.0.1.25
Micro Base Station-Configuration
================================
1 - General Parameters
2 - Management Port
3 - Data Port
4 - Authorized Managers
5 - Bridge
6 - Voice
>
```

Figure 10-11: Configuration Menu

3 Select option 2 - Management Port. A list of parameters is displayed. These parameters define the IP parameters for the MGMT port, necessary to

communicate with the operator Management network and NOC or AlvariSTAR platforms.

```
BreezeMAX/uBST 10.0.6.110
SW Version 2.0.1.25
Micro Base Station-Configuration
================================
1 - General Parameters
2 - Management Port
3 - Data Port
4 - Authorized Managers
5 - Bridge
6 - Voice
>2

BreezeMAX/uBST 10.0.6.110
SW Version 2.0.1.25
Micro Base Station-Configuration-Management Port
================================================
1 - Management Port IP Address
2 - Management Port Subnet Mask
3 - Management Port Gateway
4 - Management Port Destination Subnet
5 - Management Port Destination Subnet Mask
6 - Management Port Auto Negotiation
7 - Management Port Management Traffic Enable/disable
>
```

Figure 10-12: Management Port Menu

4 Set the following parameters:

- Management Port IP Address: The default is 10.0.0.1.
- Management Port Subnet Mask: The default is 255.255.255.0.
- Select 3 (Management Port Gateway) to configure the static route parameters that will be displayed one after the other. These include:
  - Management Port Gateway: The default is 0.0.0.0.
  - Management Port Destination Subnet: The default is 0.0.0.0.
  - Management Port Destination Subnet Mask: The default is 0.0.0.0.
- Management Port Auto Negotiation: Enable/ Disable
- Management Port Management Traffic Enable/Disable

NOTE

The Management Port Gateway, Destination Subnet and Destination Subnet Mask are grouped together. Exiting the configuration process (e.g. by pressing the Esc button) after configuring just the first one or two parameters in this group will cancel the changes made.

The subnet that is used as the Static Route for remote management via the Management port (defined by the Management Port Destination Subnet and Management Port Dest Subnet Mask parameters), must differ from the local subnet of the Management port (defined by the Management Port IP Address and Management Port Subnet Mask parameters) and from the local subnet of the Data port (defined by the Data Port IP Address and Data Port Subnet Mask parameters).

10.3.2 Data Port Definitions

10.3.2.1 Modular Base Station

To configure the Data Port:

1. In the BreezeMAX Main Menu screen, select option 2 - NPU to enter the NPU menu (see Figure 10-3).
2. Select 3 - Configuration to enter the NPU Configuration menu (see Figure 10-8).
3. In the Configuration menu, select option 2 - Data Port: A list of parameters is displayed. These parameters define the IP parameters for the Data port connecting the Base Station to the backbone.

```
BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
NPU-Configuration
=================
1 - Management Port
2 - Data Port
3 - Authorized Managers
4 - Bridge
5 - Voice
>2

BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
NPU-Configuration-Data Port
===========================
1 - Data Port IP Address
2 - Data Port Subnet Mask
3 - Data Port Gateway
4 - Data Port Management VLAN ID
5 - Data Port Speed
6 - Data Port Management Traffic Enable/Disable
>
```

Figure 10-13: Data Port Menu

4 Set the following parameters:

- Data Port IP Address: The default is 1.1.1.3.
- Data Port Subnet Mask: The default is 255.255.255.0.
- Data Port Gateway: The default is 0.0.0.0.
- Data Port Management VLAN ID: The default is null (No VLAN).
- Data Port Speed: The default is 100 Mbps.
- Data Port Management Traffic Enable/Disable: the default is Enable

10.3.2.2 Micro Base Station

To configure the Data Port:

1 In the BreezeMAX Main Menu screen, select option 2 - NPU to enter the NPU menu (see Figure 10-4).

2 Select 3 - Configuration to enter the NPU Configuration menu (see Figure 10-11).

3 In the Configuration menu, select option 2 - Data Port: A list of parameters is displayed. These parameters define the IP parameters for the Data port connecting the Base Station to the backbone.

```
BreezeMAX/uBST 10.0.6.110
SW Version 1.5.1.32
Micro Base Station-Configuration
================
1 - Management Port
2 - Data Port
3 - Authorized Managers
4 - Bridge
>2

BreezeMAX/uBST 10.0.6.110
SW Version 1.5.1.32
Micro Base Station-Configuration-Data Port
==========================
1 - Data Port IP Address
2 - Data Port Subnet Mask
3 - Data Port Gateway
4 - Data Port Management VLAN ID
5 - Data Port Speed
6 - Data Port Auto Negotiation
7 - Data Port Management Traffic Enable/Disable
>
```

Figure 10-14: Data Port Menu

4 Set the following parameters:

- Data Port IP Address: The default is 1.1.1.3.
- Data Port Subnet Mask: The default is 255.255.255.0.
- Data Port Gateway: The default is 0.0.0.0.
- Data Port Management VLAN ID: The default is null (No VLAN).
- Data Port Speed: The default is 100 Mbps.
- Data Port Auto Negotiation: Enable/Disable.
- Data Port Management Traffic Enable/Disable: the default is Enable

10.3.3 Authorized Managers Definition

10.3.3.1 Modular Base Station

To define Authorized Managers:

1 In the BreezeMAX Main Menu screen, select option 2 - NPU to enter the NPU menu (see Figure 10-3).

2 Select 3 - Configuration to enter the NPU Configuration menu (see Figure 10-8).

3 Select 3 - Authorized Managers to enter the Authorized Managers menu. The Authorized Managers menu enables to define the properties of management stations that are allowed to manage the Base Station. A list of parameters is displayed.

```
BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
NPU-Configuration
=================
1 - Management Port
2 - Data Port
3 - Authorized Managers
4 - Bridge
5 - Voice
>3

BreezeMAX/NPU 192.168.254.10
SW Version 2.0.1.5
NPU-Configuration-Authorized Managers
=====================================
1 - Show All
2 - Select
3 - Add
>
```

Figure 10-15: Authorized Managers Menu

```
BreezeMAX/NPU 10.0.22.251
SW Version 4.0.1.9
NPU-Configuration
=================
1 - Management Port
2 - Data Port
3 - Authorized Managers
4 - Bridge
5 - Voice
6 - Debug Stream
>3

BreezeMAX/NPU 10.0.22.251
SW Version 4.0.1.9
NPU-Configuration-Authorized Managers
=====================================
1 - Show All
2 - Select
3 - Add
>
```

Figure 10-16: Authorized Managers Menu

4 Select 3 - Add to add a new Authorized Manager. Up to 10 Authorized Managers can be defined.

- Define the following parameters for each Authorized Manager you add to the list:
- IP Address
- Send Traps (whether traps should be sent to the Authorized Manager)
- Read Community: The SNMP Read Community to be used by the Authorized Manager. Up to 23 printable characters, case sensitive.
- Write Community: The SNMP Write Community to be used by the Authorized Manager. Up to 23 printable characters, case sensitive.

5 Enter the IP address of the computer serving as the SNMP communication manager.

For example, if the SNMP communication manager computer is the AlvariSTAR platform, enter the IP address of the AlvariSTAR server.

10.3.3.2 Micro Base Station

To define Authorized Managers:

1 In the BreezeMAX Main Menu screen, select option 1 - Micro Base Station to enter the Micro Base Station menu (see Figure 10-4).

2 Select 3 - Configuration to enter the Micro Base Station Configuration menu (see Figure 10-11).

3 Select 4 - Authorized Managers to enter the Authorized Managers menu. The Authorized Managers menu enables to define the properties of management stations that are allowed to manage the Base Station. A list of parameters is displayed.

```
BreezeMAX/uBST 10.0.6.110
SW Version 2.0.1.25
Micro Base Station-Configuration
================================
1 - General Parameters
2 - Management Port
3 - Data Port
4 - Authorized Managers
5 - Bridge
6 - Voice
>4

BreezeMAX/uBST 10.0.6.110
SW Version 2.0.1.5
Micro Base Station-Configuration-Authorized Managers
====================================
1 - Show All
2 - Select
3 - Add
>
```

Figure 10-17: Authorized Managers Menu

4 Select 3 - Add to add a new Authorized Manager. Up to 10 Authorized Managers can be defined.

- Define the following parameters for each Authorized Manager you add to the list:
- IP Address
- Send Traps (whether traps should be sent to the Authorized Manager)
- Read Community: The SNMP Read Community to be used by the Authorized Manager. Up to 23 printable characters, case sensitive.
- Write Community: The SNMP Write Community to be used by the Authorized Manager. Up to 23 printable characters, case sensitive.

5 Enter the IP address of the computer serving as the SNMP communication manager.

For example, if the SNMP communication manager computer is the AlvariSTAR platform, enter the IP address of the AlvariSTAR server.

10.4 Base Station Network Connection Testing

This section describes the option to test that the BreezeMAX Base Station is properly connected to the Operator backbone and also that the definitions are correct.

Before initiating the test, verify that the BreezeMAX is connected using either to the DATA and/or MGMT for operator management port separately (as described in Section 10.3 above).

The test is initiated from the Operator - NOC, and can be performed from the AlvariSTAR or any computer connected to the Operator network in the NOC.

To ensure connectivity, perform a PING test with the Base Station as follows:

1 Using the IP address defined in Section 10.3.1 or Section 10.3.2 above:

- ◇ Ping < Data port IP address >

- OR -

- ◇ Ping < MNG port IP address >

The test terminates upon successful reply from the BreezeMAX Base Station in a reasonable time. If no reply is received, refer to Troubleshooting (or network administrator), Chapter 12.

The following figure shows a successful PING test to an IP device.

```
C:\ping 10.0.6.110

Pinging 10.0.6.110 with 32 bytes of data:

Reply from 10.0.6.110: bytes=32 time<1ms TTL=63
Reply from 10.0.6.110: bytes=32 time<1ms TTL=63
Reply from 10.0.6.110: bytes=32 time<1ms TTL=63
Reply from 10.0.6.110: bytes=32 time<1ms TTL=63

Ping statistics for 10.0.6.110:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss).
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\
```

Figure 10-18: PING Test

After completing the configuration of basic parameters, it is possible to configure other parameters and manage the Base Station and its components as well as the SUs connected to it, using either Telnet or SNMP.

If management traffic is enabled for both the Data Port and the Management port, then the unit can be managed by any station on any of the following subnets (provided the station is defined as an Authorized Manager):

- The local subnet of the Management port (defined by the Management Port IP Address and Management Port Subnet Mask parameters).
- The local subnet of the Data port (defined by the Data Port IP Address and Data Port Subnet Mask parameters).
- Any subnet reachable via the default Gateway of the Data port (if Data Port Gateway is defined).
- The Static Route subnet (defined by the Management Port Dest Subnet and Management Port Destination Subnet Mask parameters) reachable via the Gateway of the Management port.

11

Chapter 11 - Maintenance

In This Chapter:

The pictures are for illustrative purposes only. The actual modules may differ depending on the type used.

11.1 AU-ODU and Antenna Maintenance

Once a year, before the rain season, it is strongly recommended to check that the sealing of all outdoor connectors is intact and that the ODU and antenna are secure and undamaged.

11.2 BST-SH Maintenance

11.2.1 Replacing the BST Modules

The Base Station modules include special handles for high-force insertion/extraction of modules. Each of the 6U high modules (NPU, AU-IDU) includes two such handles, whereas each of the 3U high-modules (PIU, PSU) includes a single handle at the bottom of the front panel.

The NPU, AU-IDU and second generation PIU modules include a blue HOT SWAP LED and a micro-switch in the injector/ejector handle to support hot-swap control. After releasing the ejector's button, the HOT SWAP LED should turn on, indicating that power to/from the back-panel is disconnected and the module can be removed safely.

To replace a module with hot-swap support (NPU, AU-IDU):

NOTE

To replace a PIU with hot-swap support, refer to Section 11.2.4.

1. Release the screws at the top and the bottom of the front panel.
2. Press the handles' red button until the handles are unlocked.
3. Wait until the blue HOT SWAP LED turns on, indicationg that the module has been disconnected and can be removed.
4. Press the handles down (the upper handle)/up (the lower handle) until the module is unlocked, firmly hold the handles and remove the faulty module from the chassis.
5. Insert a new module (see Section 5.1.1.1).

To replace a PSU without HOT SWAP support:

1. Release the screw at the top of the front panel.
2. Press the handle's red button until the handle is unlocked.
3. Press the handle up until the module is unlocked, firmly hold the handle and remove the faulty module from the chassis.

4 Insert a new module (see Section 5.1.1.1).

11.2.2 Replacing an NPU

To minimize downtime and facilitate fast and easy NPU replacement, it is recommended to maintain an updated copy of the NPU configuration. Refer to the System Manual for details on preparing and uploading a backup file of the NPU configuration.

1 Release the screws at the top and the bottom of the NPU's front panel.

2 Press the handles' red button until the handles are unlocked.

3 Wait until the blue HOT SWAP LED turns on, indicating that the module has been disconnected and can be removed.

4 Press the handles down (the upper handle)/up (the lower handle) until the module is unlocked. Firmly hold the handles and take the module out of the chassis.

5 Disconnect all IF cables connecting the AU-IDUs to the AU-ODUs. This is necessary as the initial configuration of the new NPU is most probably inappropriate.

6 Firmly push the new NPU module into its intended slot (slot 5).

7 Press the handles up (the upper handle)/down (the lower handle) simultaneously until you hear the locking click and the red buttons are released. The blue HOT SWAP LED will briefly turn on, indicating that the module is being powered up.

8 Secure the module in place by closing the screws at the top and bottom of the front panel.

9 Download the backup file using a DOS based TFTP. Use the command: tftp-i <NPU port IP address> put <file name>. The default IP address of the MGMT port is 10.0.0.1.

10 Use the monitor program to configure the IP parameters (IP address, Subnet Mask, Default Gateway Address) of the MGMT port. These parameters are not affected by the loaded file.

11 Reset the system.

12 Reconnect the IF cables.

NOTE

The life span of the battery on the NPU module is approximately 8 years. The battery is not intended for replacement by the customer. The NPU module should be sent to Alvarion for replacement every 8 years.

11.2.3 Replacing the AVU

If the red ALRM LED is on while the PWR LED is green, it indicates a failure of at least one fan. Although the Base Station chassis may continue operating with one failed fan, it is recommended to replace the AVU as soon as possible.

To replace an AVU drawer:

CAUTION

The following procedure should be completed within 10 minutes.

1. Release the screws securing the AVU to the chassis.
2. Using the handle take out the faulty chassis.
3. Position the new AVU drawer on the shelf and slide it in all the way.

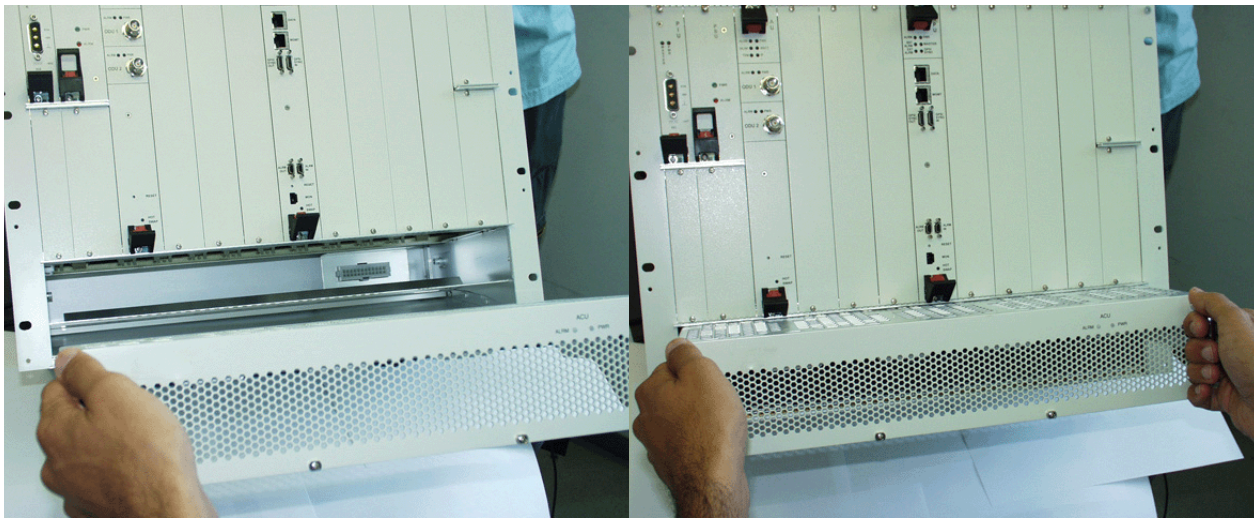


Figure 11-1: Installing the AVU - Step 1

4. Gently push until you hear a clicking sound, indicating that the connector has been locked.

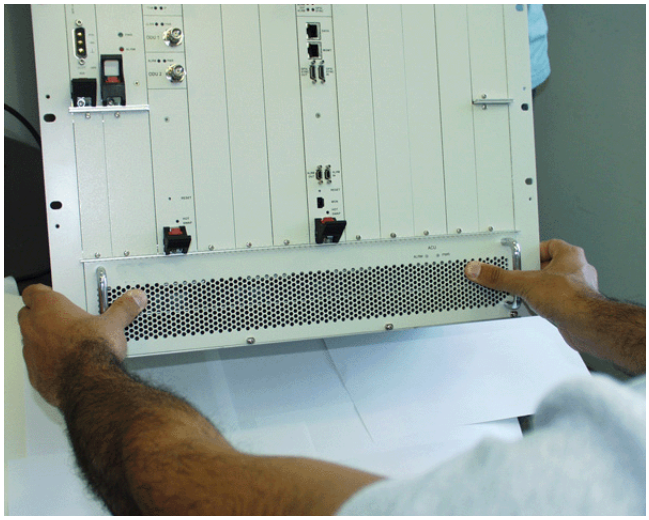


Figure 11-2: Installing the AVU - Step 2

5 Tighten the screws to secure the AVU to the chassis.

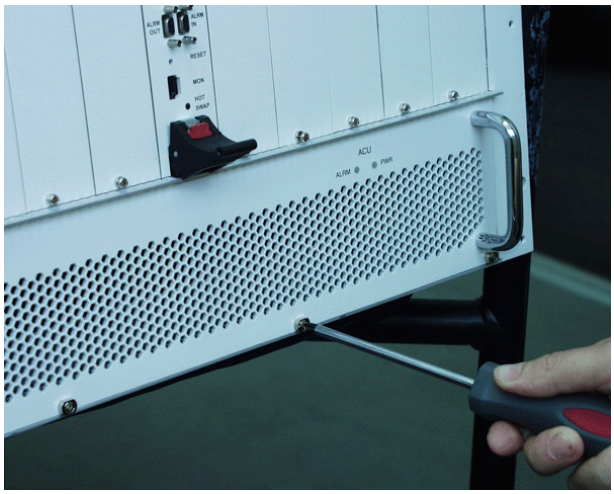


Figure 11-3: Installing the AVU - Step 3

11.2.4 Replacing a PIU

CAUTION

Before disconnecting the power cable from the PIU, the power source must be disconnected to avoid irreversible damage due to a potential excessively high transient current.

1 Release the screws at the top and the bottom of the PIU's front panel.

2 Press the handle's red button until the handle is unlocked.

3 In units with a HOT SWAP LED, wait until the blue HOT SWAP LED turns on, indicating that the module has been disconnected and can be removed.

4 Disconnect the power cable from the PIU.

5 Press the handle up until the module is unlocked. Firmly hold the handle and take the module out of the chassis.

6 Firmly push the new PIU module into its intended slot.

7 Press the handle down until you hear the locking click and the red button is released.

8 Secure the module in place by closing the screws at the top and bottom of the front panel.

9 Connect power to the PIU only after it is fully inserted into the chassis.

11.3 Micro Base Station Maintenance

11.3.1 Replacing the Fuse

The fuse is located on the rear panel of the Micro Base Station and may need replacing from time to time.

To replace the fuse:

1. Use a flat head screwdriver and turn the fuse screw anticlockwise until the screw is released.
2. Replace with a new fuse and fasten by turning the screw clockwise.

Figure 11-4: Replacing the Fuse

12

Chapter 12 - Troubleshooting

In This Chapter:

The following table lists some of the more common problems which may occur when using the BreezeMAX Base Station/Micro Base Station. Locate the problems according to the module and LED indication. Follow the instructions provided in the Corrective Action column. The more common solutions are listed first. Proceed to the next item on the list if the proposed solution did not solve the problem.

12.1 Common Problems

Table 12-1: Common Problems

H/W Interface	Problem and Indication	Possible Cause	Corrective Action
PIU Card	No Power to the card ■ PWR LED is off ■ Master LED is off	1 Chassis is not connected to the power. 2 Power Cable is not properly connected or faulty. 3 Power Supply is not properly tuned or faulty. 4 PIU card is not properly connected or is damaged.	1 Verify that power cable is properly connected (refer to "Preparing a Power Cable"). 2 Verify that external power supply output DC power is (-48) VDC. 3 Verify proper output power on the power cable connector. 4 Replace the PIU card.
	■ PWR LED is Red ■ Master LED is off ■ No Ventilation	1 Power is not connected. 2 Power input is out of range. 3 PIU card is not properly connected or is damaged. 4 Chassis is powered by the redundant PIU.	1 Verify that external power supply output DC power is (-48) VDC. 2 Verify that power cable is properly connected (refer to "Preparing a Power Cable"). 3 Disconnect power cable, eject and re-insert the card and reconnect the power cable. 4 Move the PIU module to another PIU slot. 5 Replace the PIU card. 6 Replace Chassis.
	Hot Swap LED is Blue	PIU card is not properly connected or is damaged.	1 Disconnect the power cable, eject and re-insert the card properly and reconnect the power cable. 2 Replace the PIU card.
	Hot Swap LED is OFF although the handles' RED button was pressed	PIU card is not properly connected or is damaged.	1 Disconnect the power cable, eject and re-insert the card properly and reconnect the power cable. 2 Replace the PIU card.

Table 12-1: Common Problems

H/W Interface	Problem and Indication	Possible Cause	Corrective Action
PSU Card	No Power to all cards (PIU's LEDs are OK) ■ PWR LED is OFF ■ ALRM LED is OFF	1 PSU card is not properly connected or is damaged. 2 Chassis is faulty.	1 Move the PSU module to another PSU slot (preferably at the other side of the chassis). 2 Replace PSU. 3 Replace Chassis.
	■ PWR LED is OFF ■ ALRM LED is Red	1 Power input is out of range. 2 PSU is damaged. 3 PSU is inhibited by NPU.	1 Verify that external power supply output DC power is (-48) VDC (refer to PIU section). 2 Replace PSU.
AU - IDU	PWR LED is OFF (PIU and PSU are OK)	Power supply to unit may be faulty.	1 Move the AU module to a spare AU slot. 2 Replace the AU-IDU card.
	PWR LED is Red (PIU and PSU are OK)	Power supply to unit may be faulty.	1 Move the AU module to a spare AU slot. 2 Replace the AU-IDU card.
	PWR LED is Green ALRM is Red	Hardware problem exists.	1 Eject and re-insert the card. 2 Replace the AU-IDU card.
	PWR LED is Red Hot Swap LED is Blue	The card is not properly locked.	1 Eject and re-insert the card. Secure handles until you hear the locking click. Secure the module in place by closing the screw at the top of the front panel. 2 Replace the AU-IDU card.
	WACT LED is OFF PWR LED is Green	Hardware problem exists: No SUs are connected ODU is not connected properly ODU malfunctioning	1 Eject and re-insert the card. Secure handles until you hear the locking click. Secure the module in place by closing the screw at the top of the front panel. 2 Move the AU module to a spare AU slot. 3 Check ODU cabling and LEDs 4 Replace the AU IDU card.

Table 12-1: Common Problems

H/W Interface	Problem and Indication	Possible Cause	Corrective Action
	WLNK is OFF	1 No SUs are connected 2 ODU is not connected properly 3 ODU malfunctioning	1 Connect SUs. 2 Check ODU cabling and LEDs.
	ODU1/ODU2 IDU's LEDs		
	ODU IDU PWR LED is OFF (AU PWR is Green)	No IDU to ODU power output (ODU's PWR LED is OFF)	Replace the AU-IDU card.
	ODU IDU PWR LED is Red (AU PWR is Green)	IDU to ODU power output failed.	Replace the AU-IDU card.
	ODU IDU PWR LED is Green ALRM LED is Red	Communication problem with ODU.	3 Check frequency response of the IDU-ODU cable and IF connector or replace with a new one. 4 Check ODU LED PWR - OFF - Replace ODU.
NPU Card	PWR LED is OFF (PIU and PSU are OK)	NPU is not powered.	1 Eject and re-insert the card in the same slot (No.5) 2 Move the NPU module to slot No.6. If OK - replace chassis 3 If not, replace the NPU card.
	PWR LED is Red (PIU & PSU are OK)	NPU power failure.	1 Eject and re-insert the card in the same slot (No.5). 2 Move the NPU module to slot No.6. If OK - replace chassis 3 If not, replace the NPU card.
	BST ALRM LED is Red	Failure in one (or more) Base Station modules.	Check that the Base Station modules installed (AU-ODU, AU-IDU) are OK (LEDs)
	Hot Swap	Same as the AU	
AVU Module	PWR LED is OFF ALRM is OFF	No 5V power input to the module.	1 Eject and re-insert the module. 2 Replace the AVU. 3 Replace the chassis.

Table 12-1: Common Problems

H/W Interface	Problem and Indication	Possible Cause	Corrective Action
	PWR LED is Red ALRM is Red	No 12V power input to fans.	1 Eject and re-insert the module. 2 Replace the AVU. 3 Replace the chassis
	PWR LED is Green ALRM is Red	Failure of at least one fan.	Replace the AVU.
Micro Base Station	No Power to the µBST: PWR LED is off	1 µBST is not connected to the power. 2 Power Cable is not properly connected or faulty. 3 Power Supply is not properly tuned or faulty.	1 Verify that power cable is properly connected (refer to "Preparing a Power Cable"). 2 Verify that external power supply output DC power is (-48) VDC or proper AC power. 3 Verify proper output power on the power cable connector (DC model). 4 Replace the fuse.
	PWR LED is Red	1 Power is not connected. 2 Power input is out of range.	1 Verify that external power supply output DC power is (-48) VDC or proper AC power. 2 Verify that power cable is properly connected (refer to "Preparing a Power Cable"). 3 Replace the µBST.
	ALRM LED is Red	µBST failure	Replace the µBST.
	WACT LED is OFF PWR LED is Green	Hardware problem exists	1 Turn the µBST off and tehn back on. 2 Replace the µBST.
	WLNK is OFF	1 No SUs are connected 2 ODU is not connected properly 3 ODU malfunctioning	1 Connect SUs. 2 Check ODU cabling and LEDs.
	ODU1/ODU2 IDU's LEDs		

Table 12-1: Common Problems

H/W Interface	Problem and Indication	Possible Cause	Corrective Action
	ODU IDU PWR LED is OFF	No IDU to ODU power output (ODU's PWR LED is OFF)	1 Check that the μBST PWR LED is green. 2 Replace the μBST.
	ODU IDU PWR LED is Red	IDU to ODU power output failed.	1 Check that the μBST PWR LED is green. 2 Replace the μBST.
	ODU IDU PWR LED is Green ALRM LED is Red	Communication problem with ODU.	1 Check frequency response of the IDU-ODU cable and IF connector or replace with a new one. 2 Check ODU LED PWR - OFF - Replace ODU.

A

Appendix A - Installation Checklist

In This Chapter:

Use the provided checklist to ensure that you have followed all the procedures described in this manual.

General Information:

Site/BST:			
Site ID/Name		Pole Diameter	
Address/Location		No. Of Sectors	
X/Y Coordinates		Contact Person	
Ground Height		Contact Details	
Pole/Tower Height			
Sectors:			
Site & Sectors IDs			
Azimuth			
No. Of Radios			
Radios:			
Radio Type		Antenna Tilt	
Frequency / Shift		Antenna Polarity	
Antenna Height		IF & RF Cable (types & lengths)	
Antenna Type (add ALV P/N)			

Checklist:

No.	Action	Status	Comments
1.	Inspecting and Unpacking:		
1.1	■ Chassis/System (4.2)		
1.2	■ AU-ODU (4.3)		
1.3	■ Cards/Modules (4.4)		
1.4	■ Micro Base Station IDU (4.5)		
1.5	■ ODU Power Feeder (4.6)		
2.	Mechanical Installation:		
2.1	■ Cable Guide assembled (5.1)		
2.2	■ BST-SH/µBST installed in a rack (5.1)		

No.	Action	Status	Comments
2.3	■ Modules inserted (secure, closing screws)(5.1.1.1)		
2.4	■ ODU Power Feeder installed and connected to AU-ODU-HP (5.1.3).		
2.6	■ AU-ODU installed (assemble, point the antenna, elevation adjustment, fastened) (5.2)		
2.7	■ Antenna Cable connected (fastened, cable fixed on pole) (6.1)		
2.8	■ IDU-ODU cable prepared (optional) (6.2)		
2.9	■ AU-ODU IF cable connected (6.3)		
2.10	■ Outdoor Unit grounded (6.5.1)		
2.11	■ Indoor Units grounded (6.5.2)		
2.13	■ Connectors sealed (6.6)		
3.	Connecting to Power:		
3.1	■ Cable prepared (optional) (7.1)		
3.2	■ (-48) VDC verified (7.2)		
3.3	■ Power connected (7.2)		
3.4	■ Power Up Procedure		
4.	Connecting to The Network and NMS:		
4.1	■ Network connected (8.1)		
4.2	■ NMS connected (8.2)		
5.	Commissioning Procedure:		
5.1	■ Management Port configured (10.3.1)		
5.2	■ Data Port configured (10.3.2)		
5.3	■ Authorized Managers configured (10.3.3)		
5.4	■ Base Station tested (10.4)		
General Comments			

B

Appendix B - Installation Report

In This Chapter:

This appendix provides a recommended report format to be filled out by the installer.

Site Details:

Fill in enclosed the site details:

Date:_____

Name of location, City and state: _____

Network / Deployment Manager: _____ Phone No.: _____

Installation Contractor: _____

Site Lead: _____ Phone No.: _____

Site Configuration:

Record/capture the NPU/Micro Base Station main configuration show and all AUs installed "Show parameters" captures. Rename provide each capture with an appropriate name, such as sector name, site name, etc.

Chassis/Micro Base Station Layout and Photographs:

Take high quality pictures of chassis/Micro Base Station installation (front view, rear view, layout in radio/equipment room, etc.).

If available, provide a layout/drawing of the radio/equipment room containing the rack layout in the radio room, other equipment installed in the rack (networking equipment, power DC, fibers, etc.)

Roof Plan and Sector Photographs:

Roof Plan

If available, provide a roof plan showing the radio equipment (RFU, antennas, cables, etc.), locations and cable routing.

Sector Photographs

For each sector, take high quality close-up pictures of each of the AU Antennas installed (rear view) and a picture as a reference point showing the center of the sector's coverage area.

Installation Check List:

Fill in the Installation Check List (refer to Appendix A) and attach it to this report.

Cable Sweeps

If you have proper equipment for measuring the IF cable (distance to fault, return loss), it is highly recommended to measure the cable loss and provide a graph of the cable measurements sorted by frequency rang (50 - 300 MHz).

Add a capture of each one of the cables installed per sector.

Throughput Test Results

Perform a radio link test for each of the sector installed in a reference point, as follows:

NOTE

At least two persons are required to perform this test, one at the base station and another at the SU location.

1. Locate an SU in the center of the sector (to find the location of each site, use a map, binoculars and compass).
2. Locate the SU at a location with free line of sight to the base station, and in a distance of 1Km from base station.
3. Define a service pipe for this SU with the following parameters:
4. Service Type= L2, QoS Type = BE, CT=Short, CIR=12Mbps
5. Verify that the SU is operating in the following conditions:
   - RSSI is above -70 dBm.
   - SNR higher than 25dB.
   - Modulation - 64QAM¾.
6. Connect a PC to the NPU's/Micro Base Station's DATA interface or to the switch, which is connected to the NPU/Micro Base Station.
7. Connect a PC to the SU Ethernet port.
8. Run IPERF (server) on the PC at the base station.
9. In the PC that is connected to the SU, run a throughput test using the IPERF software.
10. Repeat the previous steps (1-8) for all the AUs in the Base Station.

11 Verify that all results are as expected. The expected throughput results for 64QAM¾ are as follows:

- Uplink: 9Mbps
- Downlink: 10Mbps

Record the throughput results in the table below.

SECTOR X TEST RESULTS		
Add a picture of the SU installed aligned through the BS		
Sector X test location#1	**Description**	**Comment**
Location in NZMG		
Location in Lat./Long.		
AU/µBST Tx power		
Calculated SU RSSI		
Measured SU RSSI		
SU Tx power		
Expected Rx RSSI at BS		
Measured RSSI at BS		
IPERF TCP Uplink		
IPERF TCP Downlink		
IPERF UDP Uplink		
IPERF UDP Downlink		

C

Appendix C - Installation of "H" Mounting Bracket for Antennas and ODUs

In This Chapter:

This appendix provides instructions for installing an “H” Mounting Bracket for Antennas and ODUs. The information includes:

C.1 Overview

The “H” Mounting Bracket for Antennas and ODUs (H-Bracket) is an “H” shaped steel frame, on which up to 4 ODUs can be installed on the Base Station Tower per sector. It is designed to be installed on different types of structures with a diversity of 1.3m between antennas. Table C-1 describes the different types of structures on which an H-Bracket can be installed and the maximum number of H-Brackets that can be installed on each type of structure. A single H-Bracket covers 1 sector.

Table C-1: Types of Structures on which an H-Bracket Can Be Installed

Stucture	Diameter	Max. No. of H-Brackets
Monopole	6” - 10”	3
	10” - 14”	
	16” - 20”	
	24” - 30”	
	10” - 14”	4
	16” - 20”	
	24” - 30”	
Tower	2” - 4”	3
Mast	1.5” - 2”	3

NOTE

A number of H-Brackets can be mounted at different heights on tower legs and masts to cover more sectors.

A typical H-Bracket is shown in Figure C-1.

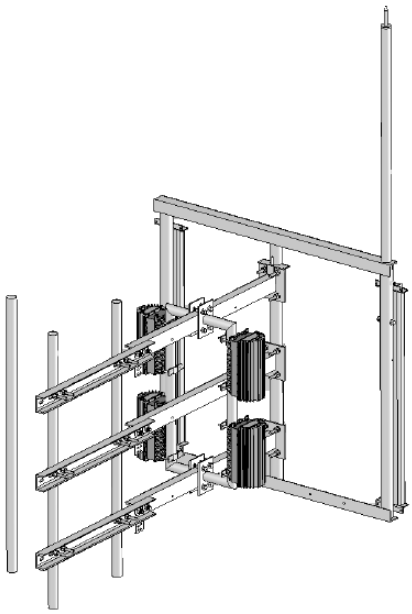


Figure C-1: Typical H-Bracket with 4 ODUs

The H-Bracket is made up of the following parts:

- **Antenna Mounting Frame (H-Frame):** The H-Frame (Figure C-2) has three 60 mm hollow pipes, placed at equal distances from each other and connected by an L-shaped steel beam at each end. There is a hole at one end of the frame to insert a lightning protector rod, and antenna cables can be secured in place with wires inserted through holes in the L-shaped beams.

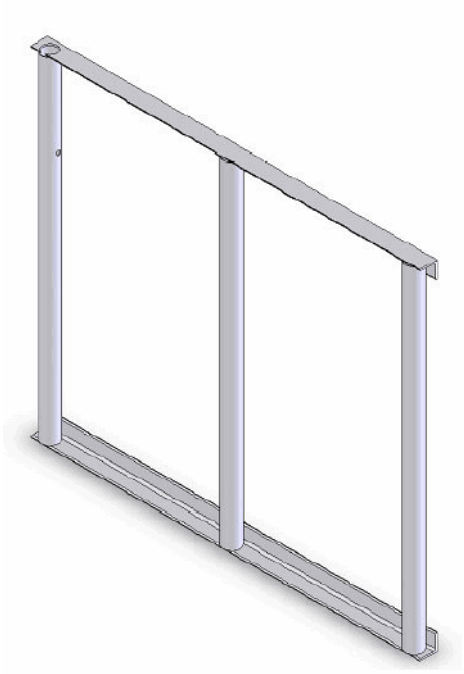


Figure C-2: H-Frame

- **Horizontal Arms:** Three horizontal arms (Figure C-3) that connect the H-Frame to clamps on the structure on which the H-Bracket is installed.

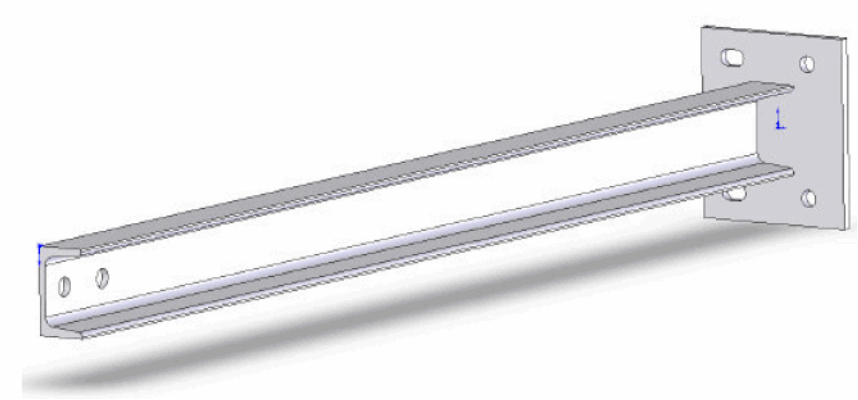


Figure C-3: Horizontal Arm

- **Radio Equipment Arms:** The radio devices are installed on a bracket (Figure C-4) attached between the upper and the lower horizontal arms connecting to the H-Frame.

Figure C-4: Radio Equipment Arm

- **Clamps:** The clamps (Figure C-5, Figure C-6, Figure C-8 and Figure C-9) are used to attach the horizontal arms to the structure on which the H-Bracket is installed. The clamps differ depending on the type of structure on which the bracket is installed and must be ordered separately. The clamps include grounding connection plates, designed for standard 3/4" or 1" cable shoes (terminal lugs). (Refer to Section 6.5 for details.)

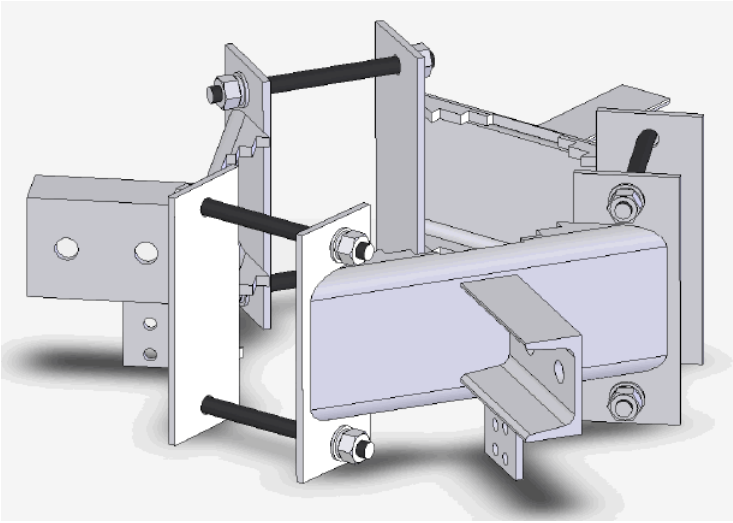


Figure C-5: 3 Sector Monopole Clamp (for 6"-10" and 10"-14" Monopoles)

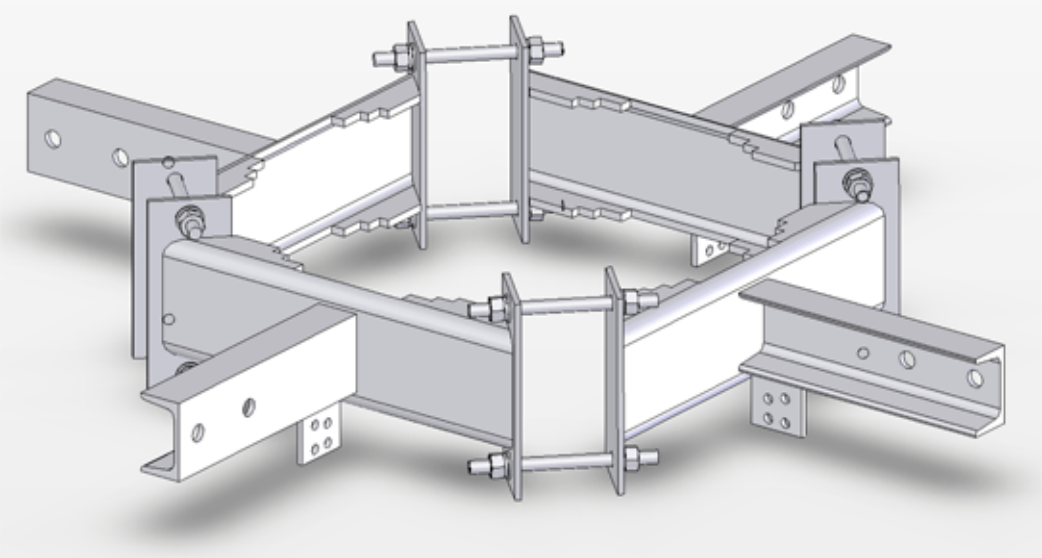


Figure C-6: 4 Sector Monopole Clamp

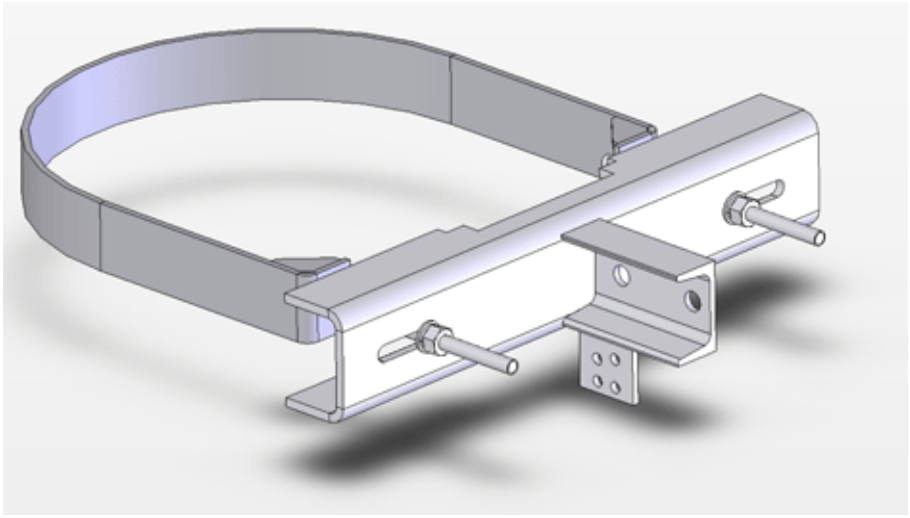


Figure C-7: 3 Sector Monopole Clamp (for 16”-20” and 24”-30” Monopoles)

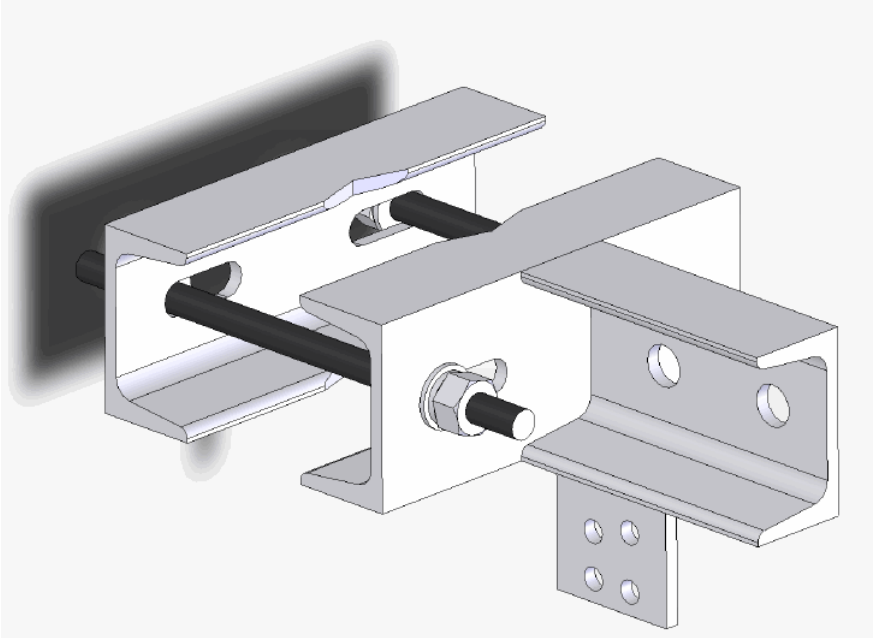


Figure C-8: Tower Leg Clamp

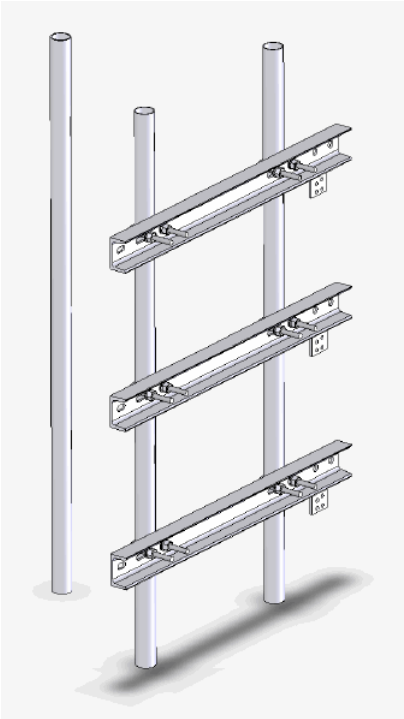


Figure C-9: Mast Clamp

- **Lightning Protector Rod:** A lightning conductor (Figure C-10) can be ordered separately. Refer to Section 2.3 for lightning protection guidelines. The lightning protector rod includes a grounding connection plate, designed for standard 3/4" or 1" cable shoe (terminal lug).

Figure C-10: Lightning Protector Rod

C.2 Product Specifications

C.2.1 Standards Compliance

Type	Standard
Wind load	ANSI/TIA/EIA-222-F
Steel Composition	AISI/SAE 1045, ST37.2 (DIN)
Welding	AWS D1.1 (American Standards)
Bolts	AISC A325 & A490

C.2.2 Mechanical

Unit	Dimensions (mm)	Quantity	Weight (kg)
Antenna Mounting Frame (H-Frame)	1300 x 1300	1	70
Horizontal Arms	1125	3	
Radio Equipment Arm	800	2	
Lightning Protector Rod	1608	1	4.5
Clamp for 6-10 Monopole (3 Sectors)		3	9.0
Clamp for 10-14 Monopole (3 Sectors)		3	75
Clamp for 16-20 Monopole (3 Sectors)		3	
Clamp for 24-30 Monopole (3 Sectors)		3	
Clamp for 10-14 Monopole (4 Sectors)		3	71
Clamp for 16-20 Monopole (4 Sectors)		3	94
Clamp for 24-30 Monopole (4 Sectors)		3	165
Clamp for 48/60 500/600 Mast		3	24

Unit	Dimensions (mm)	Quantity	Weight (kg)
Clamp for V2”-4” Tower		3	45
Clamp for V2”-4” Tower with 10° slope		3	45

C.2.3 Torques

	Open Wrench - Head Cap Screw		Socket - Head Cap Screw	
Bolt Diameter	**lb*in**	**N*m**	**lb*in**	**N*m**
1/2” (12 mm)	10	163	10.5	171
5/8” (16 mm)	20	325	21.25	346

C.3 Safety Instructions

CAUTION

ONLY experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities should install outdoor units and antennas. Failure to do so may void the product warranty and may expose the end user or Service Provider to legal and financial liabilities. Alvarion and its resellers or distributors are not liable for injury, damage or regulation violations associated with the installation of Outdoor Units or antennas.

- When working on building roofs, poles or masts, towers, monopole or on any other construction, strictly observe the local safety regulations.
- Use personal safety equipment (life line connection, safety cage on ladder, working shoes, helmet etc.) when climbing on any structure during installation and maintenance procedures.
- Never work on outdoor structures such as towers, masts, monopole, roofs, telephone lines etc. in the rain or during electrical storms.
- Take care while working near microwave radiation.
- At least two people are needed to climb up the structure in order to install the H-Bracket. It is recommended that a third person, equipped with a first aid kit and climbing gear remain on the ground during installation.
- The H-Bracket can support a maximum weight of 150 Kgs.

CAUTION

Only one person should stand on the H-Bracket at any time .

- Make sure that no unnecessary personnel are in the vicinity of the structure during installation and that all personnel wear safety helmets.
- Abide by all safety standards and regulations applicable in the country of installation.

C.4 Site Preparation

- Ensure that the structure on which the H-Bracket is to be installed is clean and that there are no objects in the vicinity that might obstruct the bracket.
- Make sure that you have ordered the correct parts and accessories for installation on the specific structure on which the H-Bracket is to be installed.
- Make sure that you have all the necessary radio planning guidelines and that you know where to position the antennas. Refer to Section 3.2 for details.
- Clear the area and make sure that there are no unnecessary personnel in the vicinity.

C.5 Tools

The following additional tools are required for installation:

- 2 closed wrenches for 12 mm (1/2 inch) diameter bolts (preferably ratchet type)
- 2 open wrenches for 12 mm (1/2 inch) diameter bolts
- 2 closed wrenches for 16 mm (5/8 inch) diameter bolts (preferably ratchet type)

C.6 Installing an H-Bracket

The H-Bracket can be installed on different types of structures. Each type of structure requires different parts and accessories and the installation procedure varies according to the structure:

- "Installing an H-Bracket on a Monopole (3 Sectors, 6"-10" and 10"-14")" on page 193
- "Installing an H-Bracket on a Monopole (3 Sectors, 16"-20" and 24"-30")" on page 199
- "Installing an H-Bracket on a Monopole (4 Sector)" on page 205
- "Installing an H-Bracket on a Tower Leg" on page 211
- "Installing an H-Bracket on a Mast" on page 218

C.6.1 Installing an H-Bracket on a Monopole (3 Sectors, 6”-10” and 10”-14”)

To install an H-Bracket on a monopole (3 sectors):

1. Check that you have all the parts and accessories necessary for installation on the monopole (Section C.6.1.1).
2. Install the clamps on the structure (Section C.6.1.2).
3. Attach the horizontal arms to the clamps (Section C.6.1.3).

NOTE

Steps 4, 5 and 6 are common to installations on all type of structures.

4. Attach the H-Frame to the horizontal arms (Section C.6.6).
5. Install the radio equipment arms and insert the lightning protection rod (Section C.6.7).
6. Connect grounding cables to the grounding connection plates on the clamps. (Refer to Section 6.5. for details.)

An example of a fully installed H-Bracket on a 3 sector monopole is shown in Figure C-11.

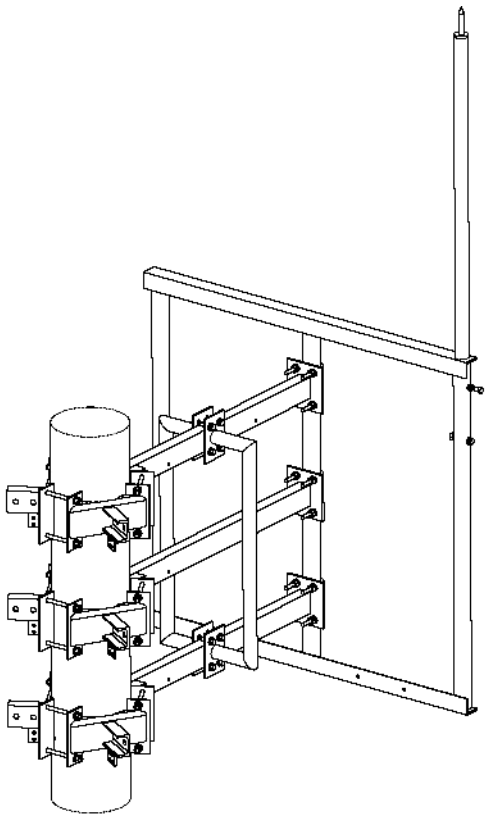


Figure C-11: H-Bracket Installed on a Monopole (3 Sectors)

C.6.1.1 Parts and Accessories for Installation on a Monopole (3 Sectors)

Table C-2 includes the parts required for installing a single H-Bracket to cover one sector. Using the same clamps, it is possible to install up to three H-Brackets on the monopole and thus cover three sectors.

NOTE

An extra 5% of spare parts will be supplied separately. In case of damaged or missing parts, please contact Alvarion.

Table C-2: List of Parts and Accessories for Installation on a Monopole (3 Sectors)

Item No.	Description	Quantity
1	Radio Equipment Arm	2
2	I 8.8 washer 5/8”	12
3	I 8.8 spring washer 5/8”	6
4	I 8.8 bolt 5/8” x 2”	6
5	Clamp for monopole (3 sectors)	3 x 3
6	I anchor bolt 1/2" SAE1045 L=180	18
7	Horizontal Arms	3
8	I 8.8 nut 5/8”	6
9	I 8.8 bolt 1/2'' x 3''	9
10	I 8.8 nut 1/2''	57
11	I 8.8 spring washer 1/2''	55
12	I 8.8 washer 1/2''	66
13	I 4.6 U bolt 1/2” x 2”	6
14	H-Frame	1
15	I 8.8 bolt 1/2” x 2”	1
16	Lightning Rod	1

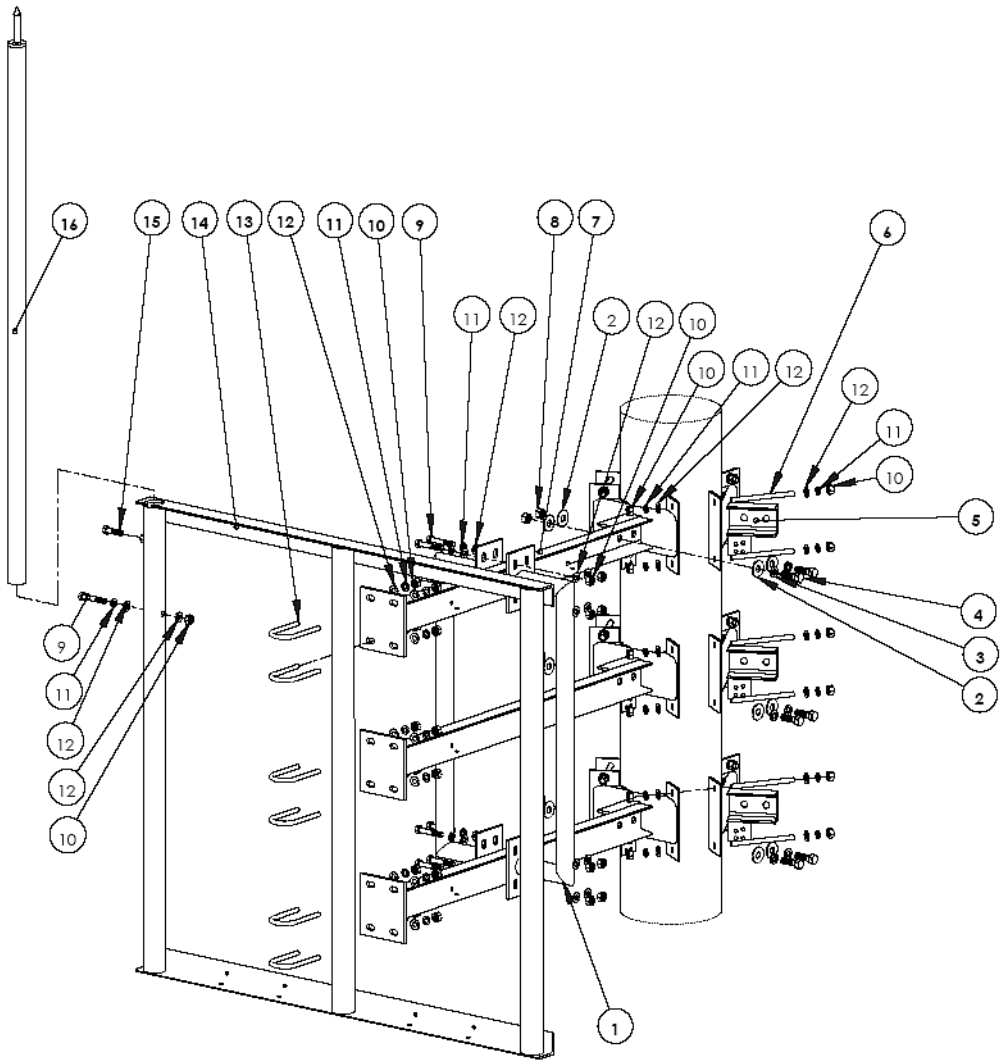


Figure C-12: Installing an H-Bracket on a Monopole (3 Sectors)

C.6.1.2 Installing Clamps on a Monopole (3 Sectors)

The clamps should be assembled at the desired height of the antennas. They can accommodate up to 3 H-Frames, covering up to 3 sectors.

1 Mark the height of the antennas on the monopole, making sure that there are no interferences 100 mm above or below this mark. The second, of the 3 clamps will be installed at this point.

2 Mark points 400 mm above and below this point. The other two clamps will be installed at these points with a total distance of 800 mm between the upper clamp and the lower clamp.

3 Assemble two sectors of each of the 3 clamps as shown in Figure C-13 using bolts, washers, spring washers and nuts from the list in Table C-3.

Table C-3: List of Parts for Installing 3 Sector Monopole Clamps

Item No.	Description	Quantity
5	Clamp for monopole (3 sectors)	3 x 3
6	I anchor bolt 1/2" SAE1045 L=180	18
10	I G5 nut 1/2”	36
11	I G5 spring washer 1/2”	36
12	I G5 washer 1/2”	36

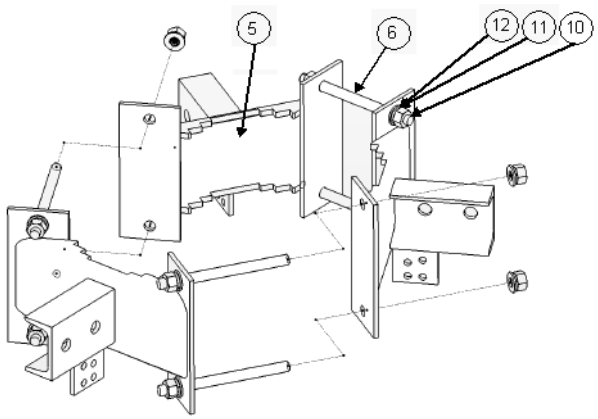


Figure C-13: Partially Assembling 3 Sector Clamp

4 Use the remaining clamp sectors, bolts, washers, spring washers and nuts to install the clamps in the positions marked on the monopole as shown in Figure C-14.

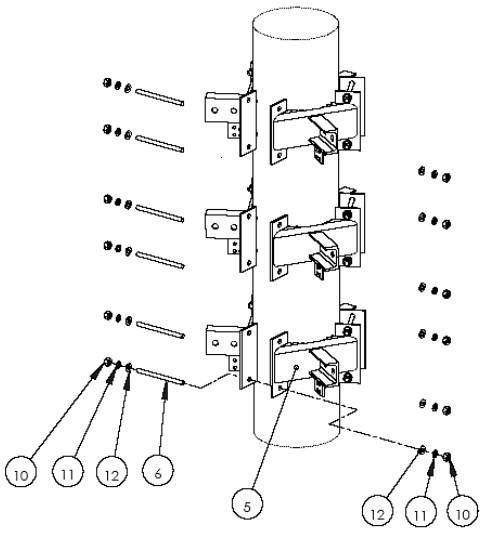


Figure C-14: Installing 3 Sector Clamp for Monopole

5 Install all 3 clamps and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.1.3 Attaching the Horizontal Arms to 3 Sector Monopole Clamps

1 Use the bolts, washers, spring washers and nuts as listed in Table C-4 to attach the 3 horizontal arms to the clamps as shown in Figure C-15.

Table C-4: Parts for Attaching Horizontal Arms to 3 Sector Monopole Clamp

Item No.	Description	Quantity
2	I 8.8 washer 5/8”	12
3	I 8.8 spring washer 5/8”	6
4	I 8.8 bolt 5/8” x 2”	6
7	Horizontal Arms	3
8	I 8.8 nut 5/8”	6

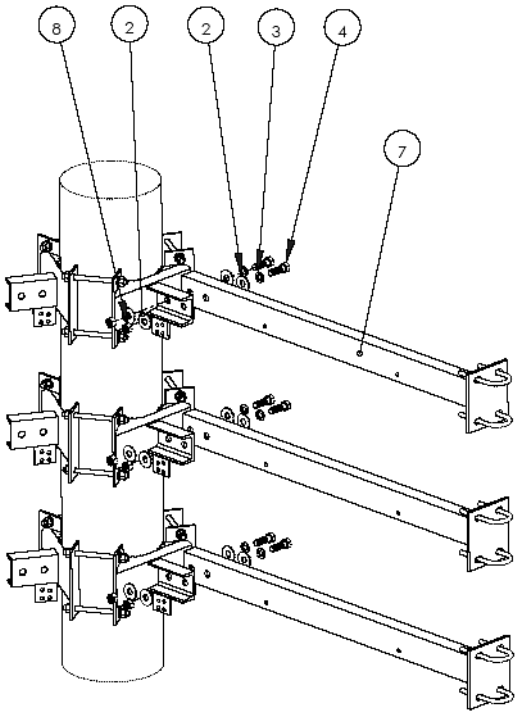


Figure C-15: Attaching Horizontal Arm to 3 Sector Monopole Clamp

2 Attach all 3 horizontal arms and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.2 Installing an H-Bracket on a Monopole (3 Sectors, 16”-20” and 24”-30”)

To install an H-Bracket on a monopole (3 sectors):

1 Check that you have all the parts and accessories necessary for installation on the monopole (Section C.6.2.1).

2 Install the clamps on the structure (Section C.6.2.2).

3 Attach the horizontal arms to the clamps (Section C.6.2.3).

NOTE

Steps 4, 5 and 6 are common to installations on all type of structures.

4 Attach the H-Frame to the horizontal arms (Section C.6.6).

5 Install the radio equipment arms and insert the lightning protection rod (Section C.6.7).

6 Connect grounding cables to the grounding connection plates on the clamps. (Refer to Section 6.5. for details.)

An example of a fully installed H-Bracket on a 3 sector 16”-20”/24”-30” monopole is shown in Figure C-16.

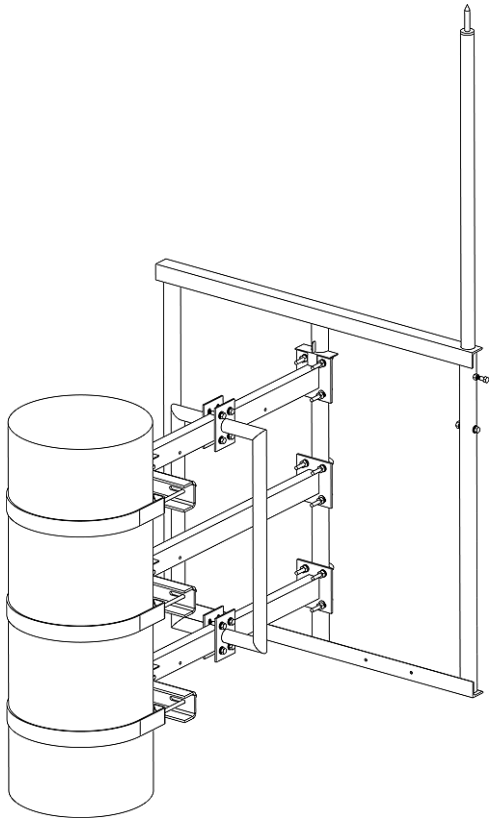


Figure C-16: H-Bracket Installed on a 16”-20”/24”-30” Monopole (3 Sectors)

C.6.2.1 Parts and Accessories for Installation on a Monopole (3 Sectors)

Table C-5 includes the parts required for installing a single H-Bracket to cover one sector. Using the same clamps, it is possible to install up to three H-Brackets on the monopole and thus cover three sectors.

NOTE

An extra 5% of spare parts will be supplied separately. In case of damaged or missing parts, please contact Alvarion.

Table C-5: List of Parts and Accessories for Installation on a Monopole (3 Sectors)

Item No.	Description	Quantity
1	Radio Equipment Arm	2
2	I 8.8 washer 5/8”	12
3	I 8.8 spring washer 5/8”	6
4	I 8.8 bolt 5/8” x 2”	6
5	Clamp for 16”-20”/24”-30” monopole (3 sectors)	3 x 3
6	I anchor bolt 1/2" SAE1045 L=240	6
7	Horizontal Arms	3
8	I 8.8 nut 5/8”	6
9	I 8.8 bolt 1/2'' x 3''	9
10	I 8.8 nut 1/2''	33
11	I 8.8 spring washer 1/2''	33
12	I 8.8 washer 1/2''	42
13	I 4.6 U bolt 1/2” x 2”	6
14	H-Frame	1
15	I 8.8 bolt 1/2” x 2”	1
16	Lightning Rod	1

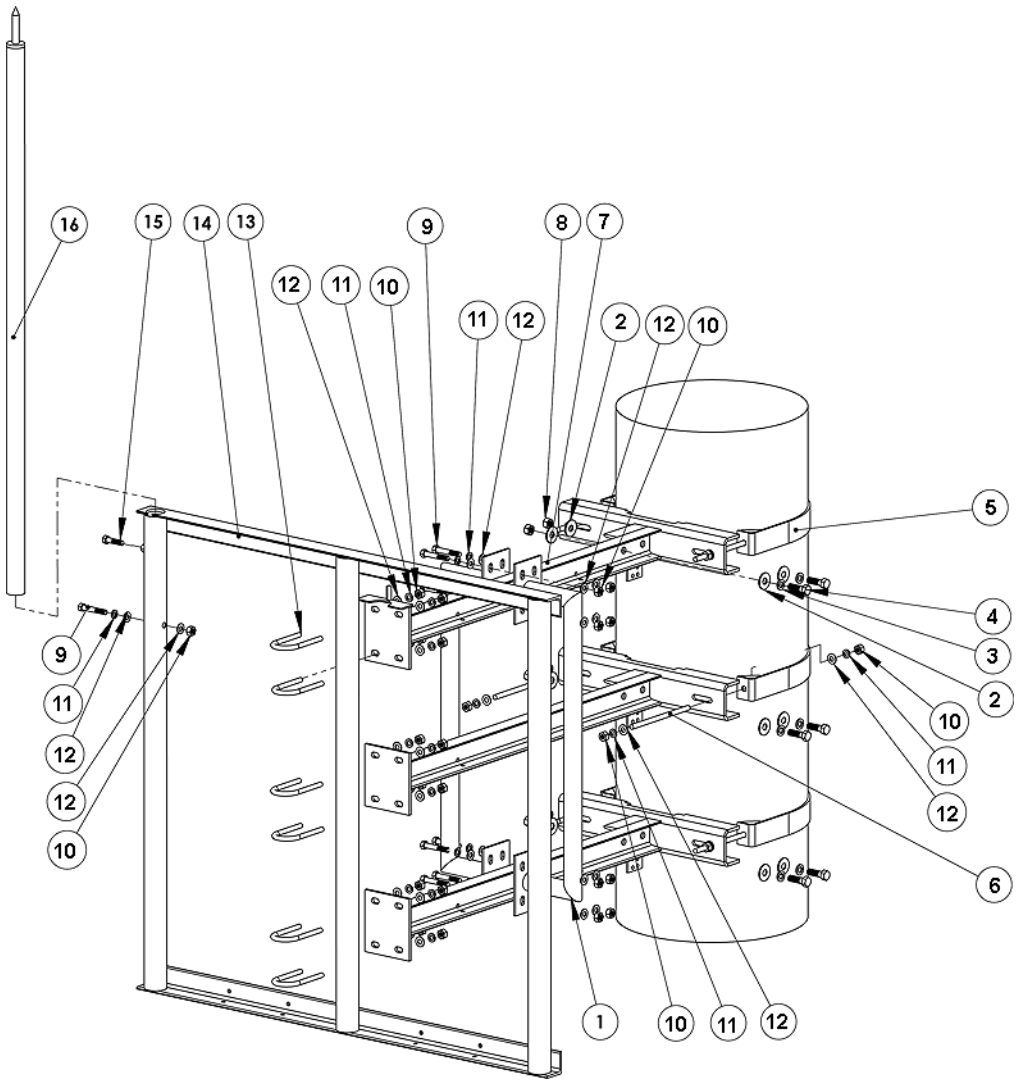


Figure C-17: Installing an H-Bracket on a 16”-20”/24”-30” Monopole (3 Sectors)

C.6.2.2 Installing Clamps on a 16”-20”/24”-30” Monopole (3 Sectors)

The clamps should be assembled at the desired height of the antennas. They can accommodate up to 3 H-Frames, covering up to 3 sectors.

1 Mark the height of the antennas on the monopole, making sure that there are no interferences 100 mm above or below this mark. The second, of the 3 clamps will be installed at this point.

2 Mark points 400 mm above and below this point. The other two clamps will be installed at these points with a total distance of 800 mm between the upper clamp and the lower clamp.

3 Assemble the 3 clamps as shown in Figure C-18 using bolts, washers, spring washers and nuts from the list in Table C-6.

Table C-6: List of Parts for Installing 3 Sector Monopole Clamps

Item No.	Description	Quantity
5	Clamp for monopole (3 sectors)	3 x 3
6	I anchor bolt 1/2" SAE1045 L=240	6
10	I 8.8 nut 1/2”	12
11	I 8.8 spring washer 1/2”	12
12	I 8.8 washer 1/2”	12

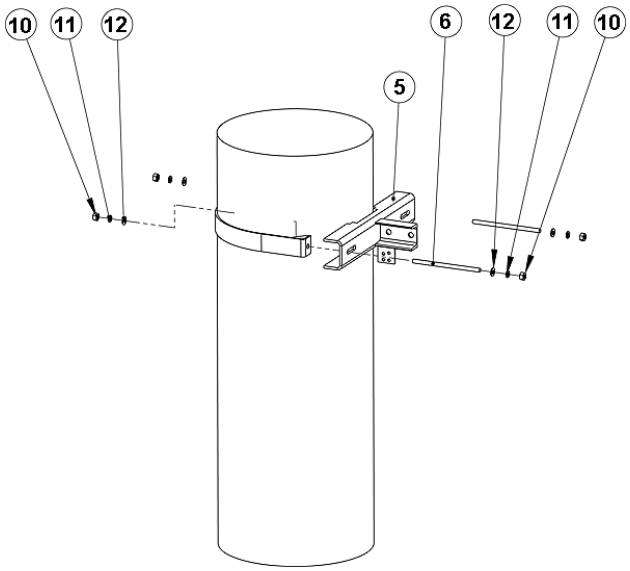


Figure C-18: Installing 3 Sector Clamps for 16”-20”/24”-30” Monopole

4 Install all 3 clamps and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.2.3 Attaching the Horizontal Arms to 3 Sector Monopole Clamps

1 Use the bolts, washers, spring washers and nuts as listed in Table C-7 to attach the 3 horizontal arms to the clamps as shown in Figure C-19.

Table C-7: Parts for Attaching Horizontal Arms to 3 Sector Monopole Clamp

Item No.	Description	Quantity
2	I 8.8 washer 5/8”	12
3	I 8.8 spring washer 5/8”	6
4	I 8.8 bolt 5/8” x 2”	6
7	Horizontal Arms	3
8	I 8.8 nut 5/8”	6

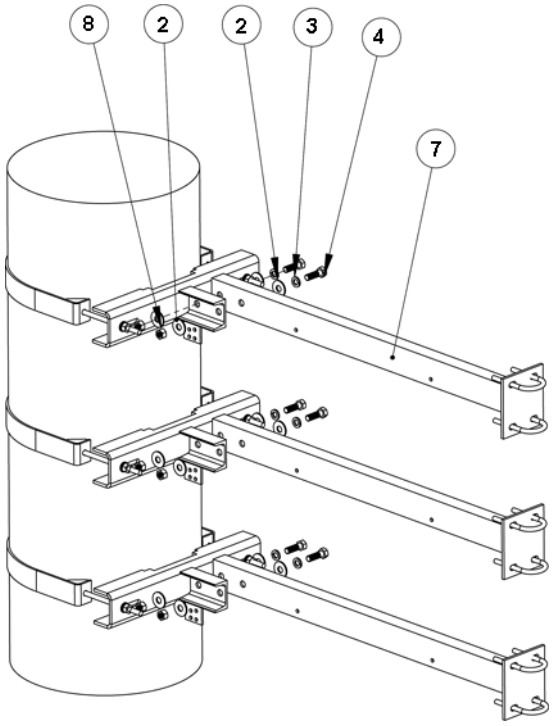


Figure C-19: Attaching Horizontal Arm to 3 Sector Monopole Clamp (for 16”-20”/24”-30”)

2 Attach all 3 horizontal arms and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.3 Installing an H-Bracket on a Monopole (4 Sector)

To install an H-Bracket on a monopole (4 sectors):

1. Check that you have all the parts and accessories necessary for installation on the monopole (Section C.6.3.2).
2. Install the clamps on the structure (Section C.6.3.2).
3. Attach the horizontal arms to the clamps (Section C.6.3.3).

NOTE

Steps 4, 5 and 6 are common to installations on all type of structures.

4. Attach the H-Frame to the horizontal arms (Section C.6.6).
5. Install the radio equipment arms and insert the lightning protection rod (Section C.6.7).
6. Connect grounding cables to the grounding connection plates on the clamps. (Refer to Section 6.5. for details.)

An example of a fully installed H-Bracket on a 4 sector monopole is shown in Figure C-20.

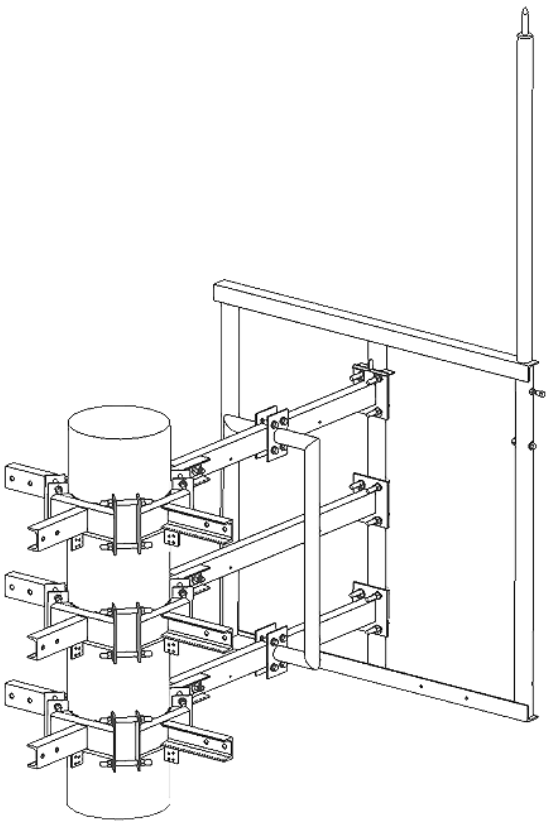


Figure C-20: H-Bracket Installed on a Monopole (4 Sectors)

C.6.3.1 Parts and Accessories for Installation on a Monopole (4 Sectors)

Table C-8 includes the parts required for installing a single Antenna Mounting Bracket to cover one sector. Using the same clamps, it is possible to install up to four H-Brackets on the monopole and thus cover four sectors.

NOTE

An extra 5% of spare parts will be supplied separately. In case of damaged or missing parts, please contact Alvarion.

Table C-8: List of Parts and Accessories for Installation on a Monopole (4 Sectors)

Item No.	Description	Quantity
1	Radio Equipment Arm	2
2	I anchor bolt 1/2" SAE1045 L=180	24
3	Clamp for monopole (4 sectors)	3 x 4
4	I 8.8 bolt 5/8” x 2”	6
5	I 8.8 spring washer 5/8”	6
6	I 8.8 washer 5/8” x 2”	12
7	I 8.8 nut 5/8”	6
8	Horizontal Arms	3
9	I 8.8 bolt 1/2'' x 3''	9
10	I 8.8 nut 1/2''	69
11	I 8.8 spring washer 1/2''	69
12	I 8.8 washer 1/2''	78
13	I 4.6 U bolt 1/2” x 2”	6
14	H-Frame	1
15	I 8.8 bolt 1/2” x 2”	1
16	Lightning Rod	1

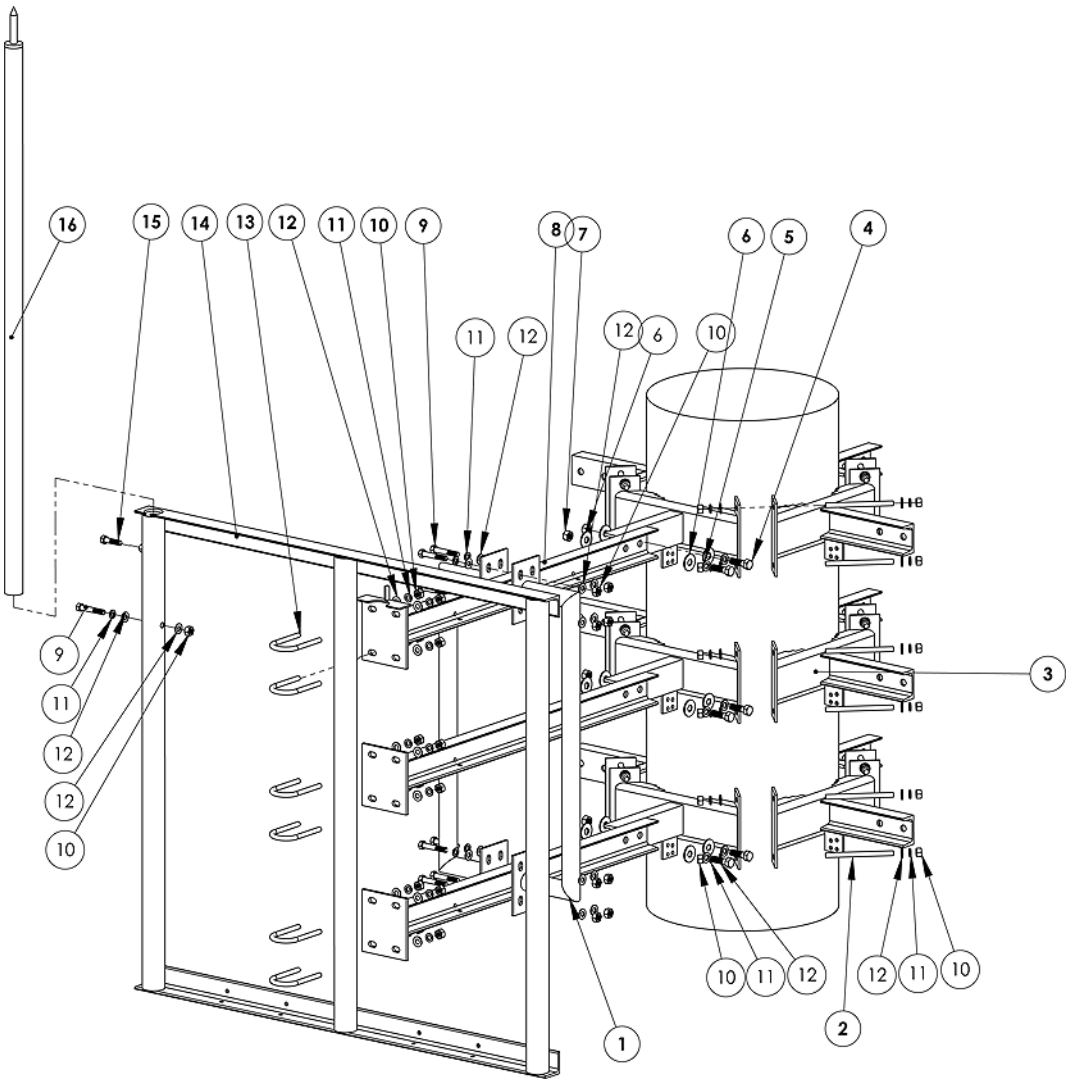


Figure C-21: Installing an H-Bracket on a Monopole (4 Sectors)

C.6.3.2 Installing Clamps on a Monopole (4 Sectors)

The clamps should be assembled at the desired height of the antennas. They can accommodate up to 4 H-Frames, covering up to 4 sectors.

1 Mark the height of the antennas on the monopole, making sure that there are no interferences 100 mm above or below this mark. The second of the 3 clamps will be installed at this point.

2 Mark points 400 mm above and below this point. The other two clamps will be installed at these points with a total distance of 800 mm between the upper clamp and the lower clamp.

3 Assemble three sectors of each of the 3 clamps as shown in Figure C-22 using bolts, washers, spring washers and nuts from the list in Table C-9.

Table C-9: List of Parts for Installing 4 Sector Monopole Clamps

Item No.	Description	Quantity
2	I anchor bolt 1/2" SAE1045 L=180	24
3	Clamp for monopole (4 sectors)	3 x 4
10	I 8.8 nut 1/2"	48
11	I 8.8 spring washer 1/2"	48
12	I 8.8 washer 1/2"	48

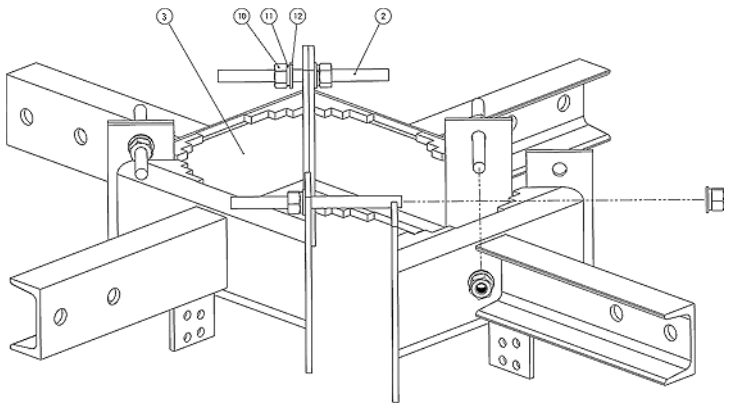


Figure C-22: Partially Assembling 4 Sector Clamp

4 Use the remaining clamp sectors, bolts, washers, spring washers and nuts to install the clamps in the positions marked on the monopole as shown in Figure C-23.

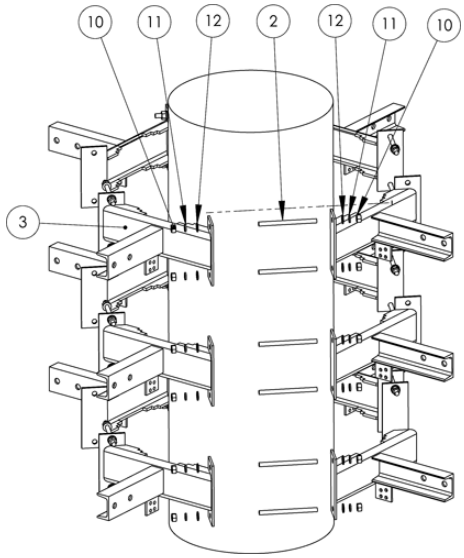


Figure C-23: Installing 4 Sector Clamp for Monopole

5 Install all 3 clamps and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.3.3 Attaching the Horizontal Arms to 4 Sector Monopole Clamps

1 Use the bolts, washers, spring washers and nuts as listed in Table C-10 to attach the 3 horizontal arms to the clamps as shown in Figure C-24.

Table C-10: Parts for Attaching Horizontal Arms to 4 Sector Monopole Clamp

Item No.	Description	Quantity
4	I 8.8 bolt 5/8” x 2”	6
5	I 8.8 spring washer 5/8”	6
6	I 8.8 washer 5/8” x 2”	12
7	I 8.8 nut 5/8”	6
8	Horizontal Arms	3

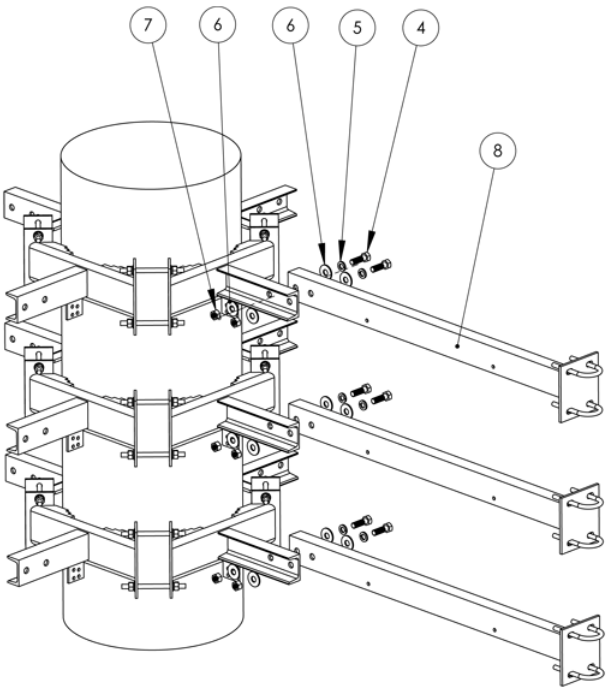


Figure C-24: Attaching Horizontal Arm to 4 Sector Monopole Clamp

2 Attach all 3 horizontal arms and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.4 Installing an H-Bracket on a Tower Leg

To install an H-Bracket on a tower leg:

1 Check that you have all the parts and accessories necessary for installation on a tower leg (Section C.6.4.1).

2 Install the clamps on the structure (Section C.6.4.2).

3 Attach the horizontal arms to the clamps (Section C.6.4.3).

NOTE

Steps 4, 5 and 6 are common to installations on all type of structures.

4 Attach the H-Frame to the horizontal arms (Section C.6.6).

5 Install the radio equipment arms and insert the lightning protection rod (Section C.6.7).

6 Connect grounding cables to the grounding connection plates on the clamps. (Refer to Section 6.5. for details.)

An example of a fully installed H-Bracket on a tower leg is shown in Figure C-25.

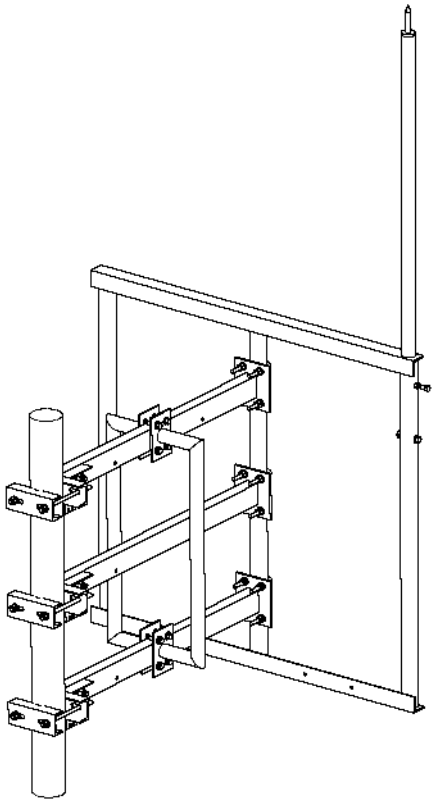


Figure C-25: H-Bracket Installed on a Tower Leg

C.6.4.1 Parts and Accessories for Installation on a Tower Leg

NOTE

An extra 5% of spare parts will be supplied separately. In case of damaged or missing parts, please contact Alvarion.

Table C-11: List of Parts and Accessories for Installation on a Tower Leg

Item No.	Description	Quantity
1	Radio Equipment Arm	2
2	Clamp for tower leg	3
3	I anchor bolt 1/2” SAE1045 L=240	6
4	I 8.8 bolt 5/8” x 2”	6
5	I 8.8 spring washer 5/8”	6
6	I 8.8 washer 5/8” x 2”	12
7	I 8.8 nut 5/8”	6
8	Horizontal Arms	3
9	I 8.8 bolt 1/2'' x 3''	9
10	I 8.8 nut 1/2''	33
11	I 8.8 spring washer 1/2''	33
12	I 8.8 washer 1/2''	42
13	I 4.6 U bolt 1/2” x 2”	6
14	H-Frame	1
15	I 8.8 bolt 1/2” x 2”	1
16	Lightning Rod	1

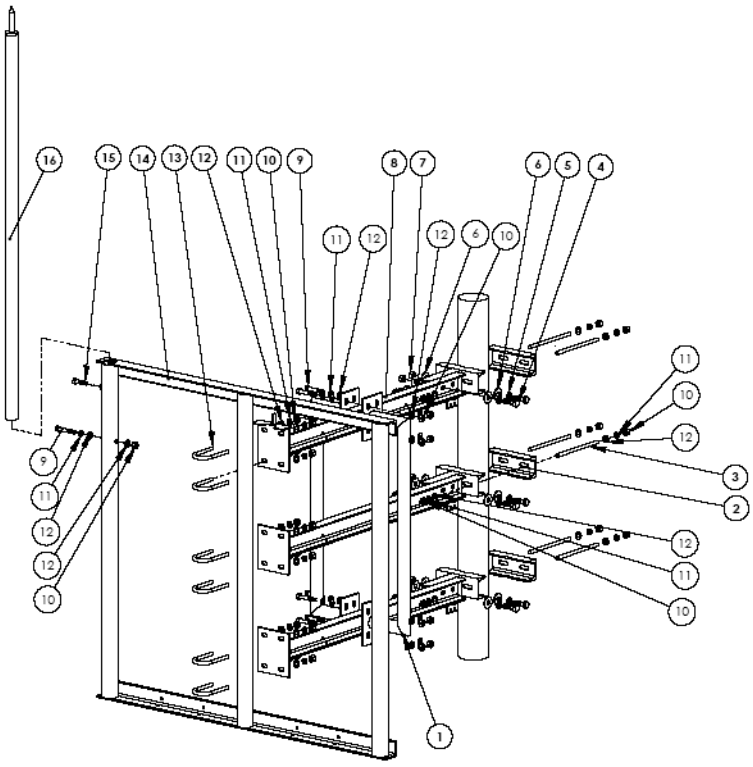


Figure C-26: Installing an H-Bracket on a Tower Leg

C.6.4.2 Installing Clamps on a Tower Leg

The clamps should be assembled at the desired height of the antennas.

1. Mark the height of the antennas on the tower leg, making sure that there are no interferences 100 mm above or below this mark. The second, of the 3 clamps will be installed at this point.
2. Mark points 400 mm above and below this point. The other two clamps will be installed at these points with a total distance of 800 mm between the upper clamp and the lower clamp.
3. Use the bolts, washers, spring washers and nuts as listed in Table C-12 to install the clamps in the positions marked as shown in Figure C-27.

Table C-12: List of Parts for Installing Clamps on a Tower Leg

Item No.	Description	Quantity
2	Clamp for tower leg	3
3	I anchor bolt 1/2” SAE1045 L=240	6
10	I 8.8 nut 1/2"	12
11	I 8.8 spring washer 1/2"	12
12	I 8.8 washer 1/2"	12

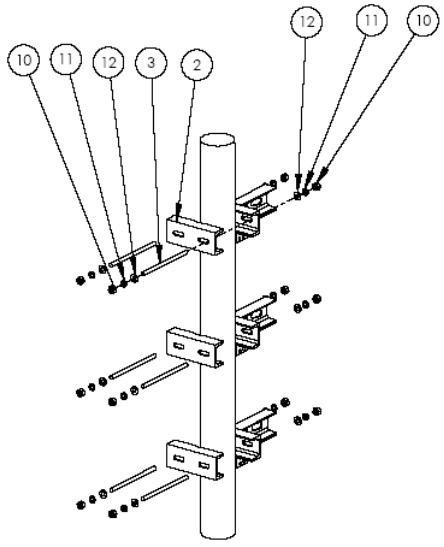


Figure C-27: Installing Clamps on a Tower Leg

4 Install all 3 clamps and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.4.3 Attaching the Horizontal Arms to Clamps on a Tower Leg

1 Adjust the angle of the arms of the clamps downwards to a maximum of 10^{o} so that when the horizontal arms are attached, they are horizontal and not at an angle.

2 Use the bolts, washers, spring washers and nuts as listed in Table C-13 to attach the 3 horizontal arms to the clamps as shown in Figure C-28.

Table C-13: Parts for Attaching Horizontal Arms to Clamp on a Tower Leg

Item No.	Description	Quantity
4	I 8.8 bolt 5/8” x 2”	6
5	I 8.8 spring washer 5/8”	6
6	I 8.8 washer 5/8” x 2”	12
7	I 8.8 nut 5/8”	6
8	Horizontal Arms	3

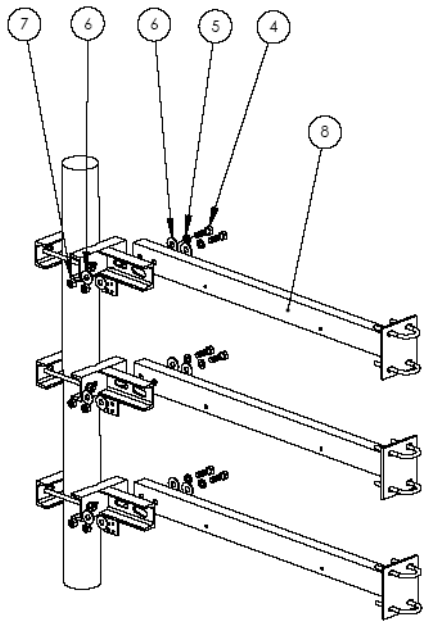


Figure C-28: Attaching Horizontal Arm to Clamp on Tower Leg

3 Attach all 3 horizontal arms and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.5 Installing an H-Bracket on a Mast

To install an H-Bracket on a mast:

1. Check that you have all the parts and accessories necessary for installation on the specific structure (Section C.6.5.1).
2. Install the clamps on the structure (Section C.6.5.2).
3. Attach the horizontal arms to the clamps (Section C.6.5.3).

NOTE

Steps 4, 5 and 6 are common to installations on all type of structures.

4. Attach the H-Frame to the horizontal arms (Section C.6.6).
5. Install the radio equipment arms and insert the lightning protection rod (Section C.6.7).
6. Connect grounding cables to the grounding connection plates on the clamps. (Refer to Section 6.5. for details.)

An example of a fully installed H-Bracket on a mast is shown in Figure C-29.

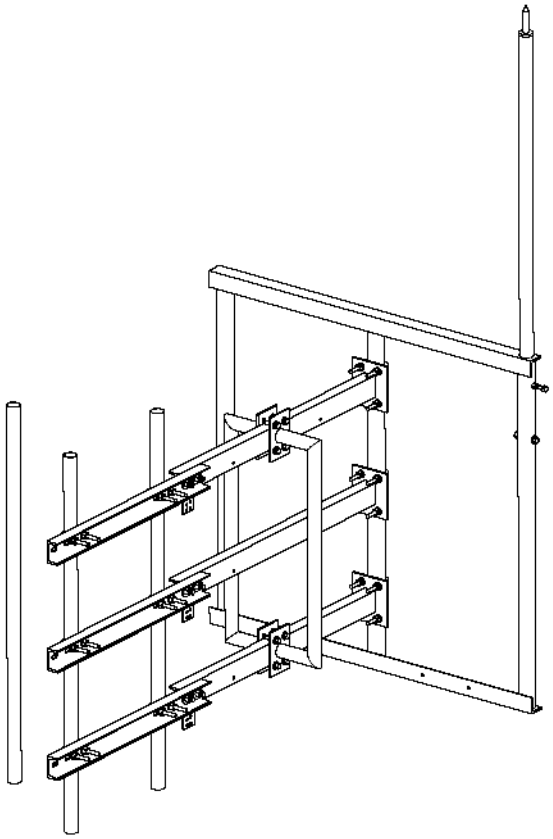


Figure C-29: H-Bracket Installed on a Mast

C.6.5.1 Parts and Accessories for Installation on a Mast

NOTE

An extra 5% of spare parts will be supplied separately. In case of damaged or missing parts, please contact Alvarion.

Table C-14: List of Parts and Accessories for Installation on a Mast

Item No.	Description	Quantity
1	Radio Equipment Arm	2
2	Horizontal Arms	3
3	I 8.8 nut 5/8”	6
4	Clamp for mast	3
5	I 4.6 U BOLT 1/2" x 1 1/2"	6
6	I 8.8 bolt 5/8” x 2”	6
7	I 8.8 spring washer 5/8”	6
8	I 8.8 washer 5/8” x 2”	12
9	I 8.8 bolt 1/2" x 3"	9
10	I 8.8 nut 1/2"	33
11	I 8.8 spring washer 1/2"	33
12	I 8.8 washer 1/2"	42
13	I 4.6 U bolt 1/2” x 2”	6
14	H-Frame	1
15	I 8.8 bolt 1/2” x 2”	1
16	Lightning Rod	1

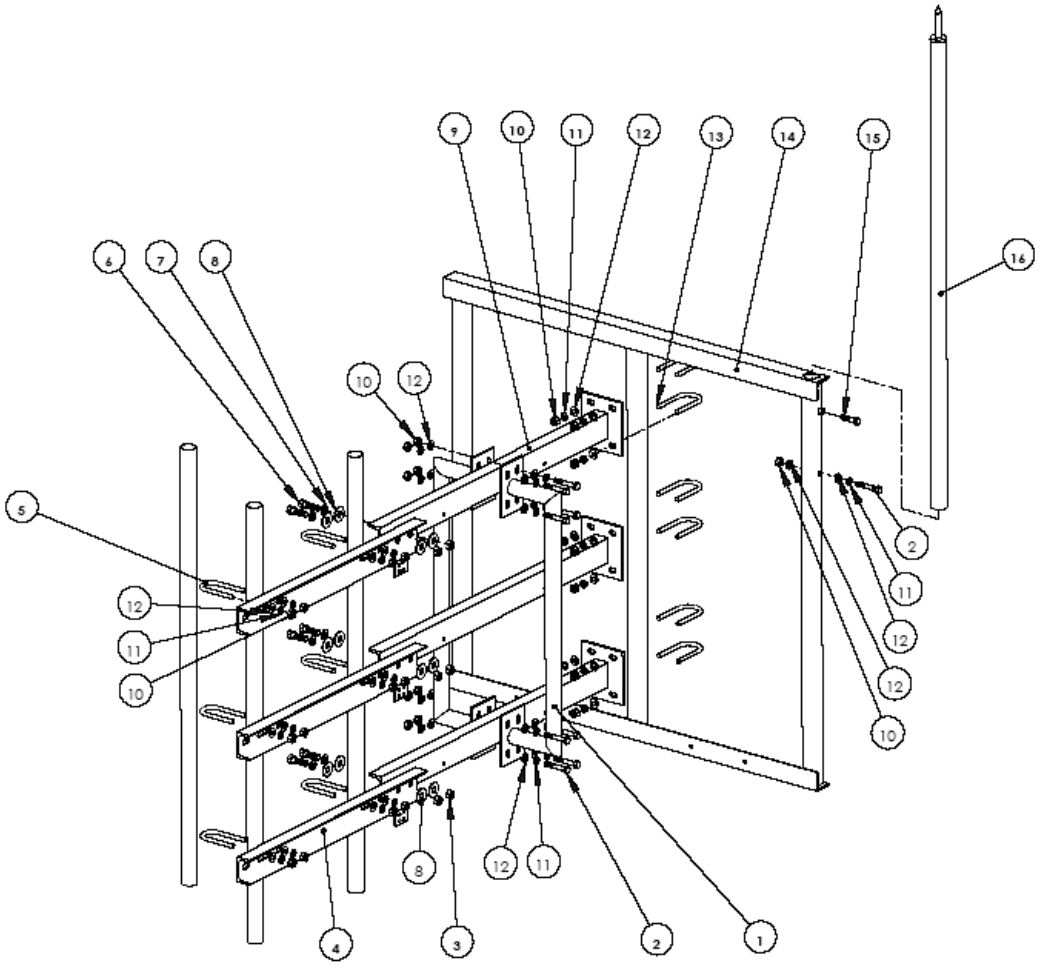


Figure C-30: Installing an H-Bracket on a Mast

C.6.5.2 Installing Clamps on a Mast

The clamps should be assembled at the desired height of the antennas.

1. Mark the height of the antennas on the mast, making sure that there are no interferences 100 mm above or below this mark. The second, of the 3 clamps will be installed at this point.
2. Mark points 400 mm above and below this point. The other two clamps will be installed at these points with a total distance of 800 mm between the upper clamp and the lower clamp.
3. Use the U bolts, washers, spring washers and nuts as listed in Table C-15 to install the clamps in the positions marked as shown in Figure C-31.

Table C-15: List of Parts for Installing Clamp on a Mast

Item No.	Description	Quantity
4	Clamp for mast	3
5	I 4.6 U bolt 1/2" x 1 1/2"	6
10	I 8.8 nut 1/2"	12
11	I 8.8 spring washer 1/2"	12
12	I 8.8 washer 1/2"	12

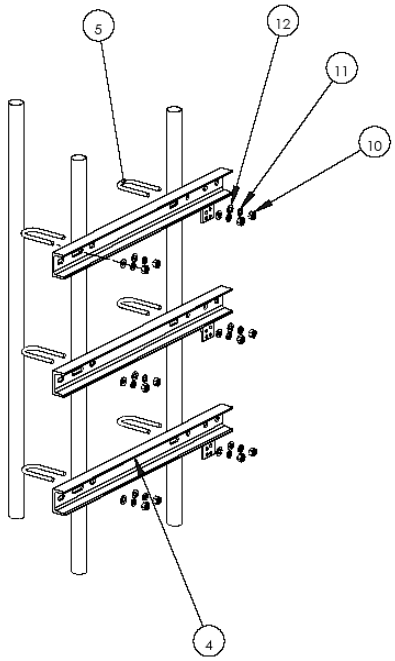


Figure C-31: Installing Clamps on a Mast

4 Attach all 3 clamps and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.5.3 Attaching the Horizontal Arms to Clamps on Mast

1 Use the bolts, washers, spring washers and nuts as listed in Table C-16 to attach the 3 horizontal arms to the clamps as shown in Figure C-32.

Table C-16: Parts for Attaching Horizontal Arms to Clamps on a Mast

Item No.	Description	Quantity
2	Horizontal Arms	3
3	I 8.8 nut 5/8”	6
6	I 8.8 bolt 5/8” x 2”	6
7	I 8.8 spring washer 5/8”	6
8	I 8.8 washer 5/8” x 2”	12

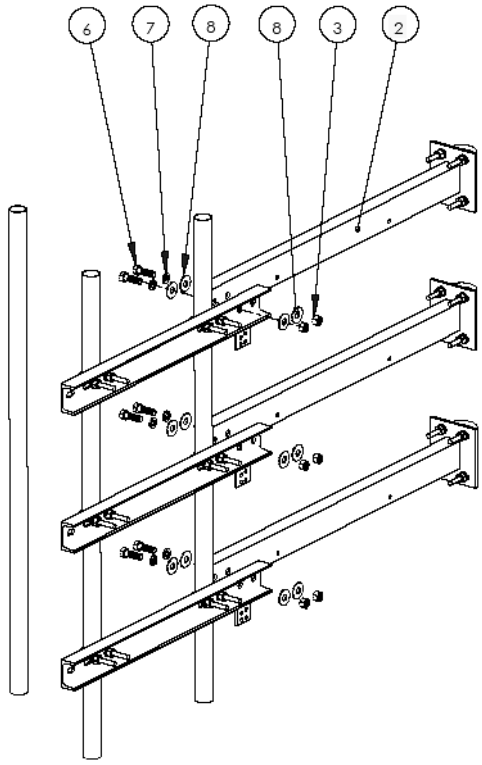


Figure C-32: Attaching Horizontal Arm to Clamp on a Mast

2 Attach all 3 horizontal arms and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.6 Attaching the H-Frame to the Horizontal Arms

NOTE

The procedure for attaching the H-Frame to the horizontal arms is the same for all types of structures. Figure C-33 illustrates the procedure for installation on a 3 sector monopole.

1. Position the H-Frame so that the hole for inserting the lightning rod is at the top and the middle pipe is adjacent to the plates on the horizontal arms.
2. Use the bolts, washers, spring washers and nuts as listed in Table C-17 to attach the middle pipe of the H-Frame to the plates at the end of each of the 3 horizontal arms as shown in Figure C-33.

Table C-17: List of Parts for Attaching the H-Frame to the Horizontal Arms

Item No.	Description	Quantity
9	I 8.8 bolt 1/2'' x 3''	1
10	I 8.8 nut 1/2”	13
11	I 8.8 spring washer 1/2”	13
12	I 8.8 washer 1/2”	14
13	I 4.6 U bolt 1/2'' x 2”	6
14	H-Frame	1

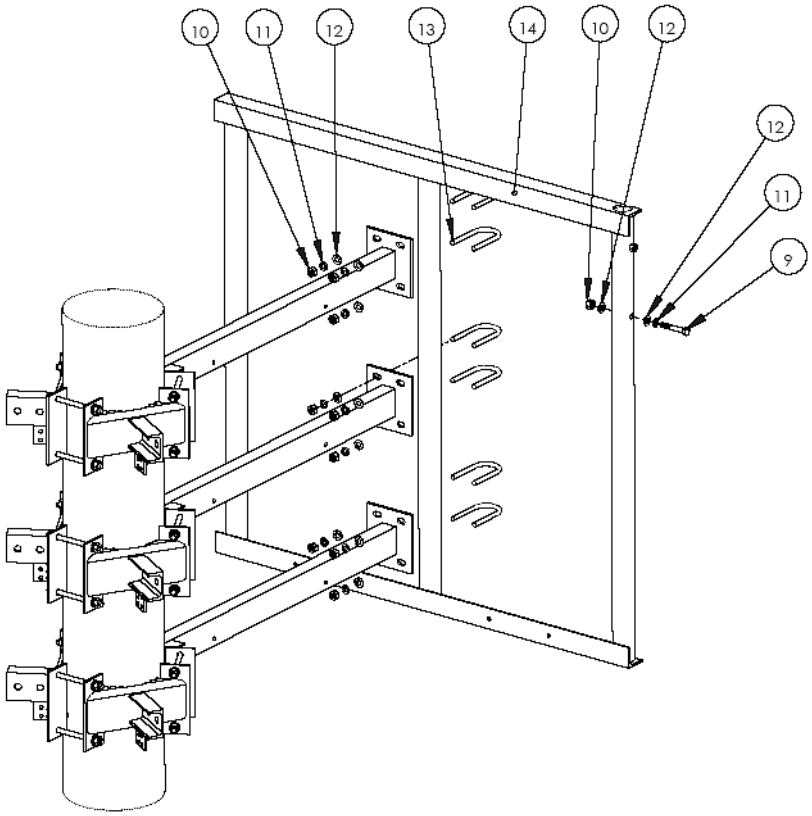


Figure C-33: Attaching H-Frame to Horizontal Arms

3 Secure a bolt through the pipe in the H-Frame to act as stopper when inserting the lightning protection rod (Section C.6.7) and tighten the bolts and screws according to the torque as noted in Section C.2.3.

C.6.7 Installing the Radio Equipment Arms and Lightning Protector Rod

The radio equipment arms should be attached to the upper and lower horizontal arms. The exact position on the arms should be determined in the field and is dependent on accessibility and the functionality of the radio equipment.

NOTE

The procedure for installing the radio equipment arms and lightning protector rod is the same for all types of structures. Figure C-34 illustrates the procedure for installation on a 3 sector monopole.

1. Determine the best position to install the radio equipment arms.
2. Place the two arms (Item No. 1) facing each other as shown in Figure C-34 and using the bolts, washers, spring washers and nuts as listed in Table C-18, attach the two radio equipment arms to the upper and lower horizontal arms.

Table C-18: List of Parts for Installing the Radio Equipment Arms and Lightning Protector Rod

Item No.	Description	Quantity
1	Radio Equipment Arm	2
9	I 8.8 bolt 1/2'' X 3”	8
10	I 8.8 nut 1/2”	8
11	I 8.8 spring washer 1/2”	8
12	I 8.8 washer 1/2”	16
15	I 8.8 bolt 1/2'' X 2”	1
16	Lightning Rod	1

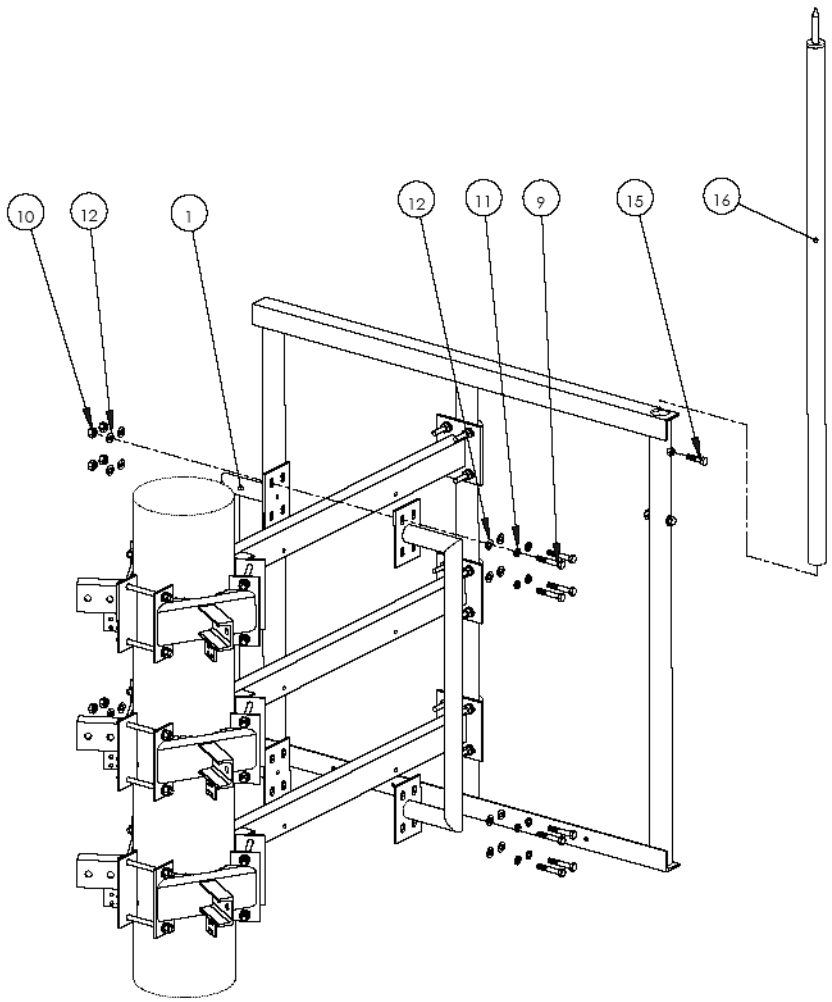


Figure C-34: Attaching Radio Equipment Arms and Lightning Protector Rod.

3 Insert the lightning rod into the hole in the pipe at the top of the H-Frame as far as the stopper and secure in place with the nut on the side of the pipe.

4 Tighten the bolts and screws according to the torque as noted in Section C.2.3.

Glossary

AAA	Authentication, Authorization, and Accounting (Pronounced "triple a."). A system (or several systems) that controls what resources users have access to, and keeps track of the activity of users over the network.
ANSI	American National Standards Institute. A voluntary organization composed of corporate, government, and other members that coordinates standards-related activities, approves U.S. national standards, and develops positions for the United States in international standards organizations.
ASCII	American Standard Code for Information Interchange. A code for representing English characters as numbers, with each letter assigned a number from 0 to 127.
ATM	Asynchronous Transfer Mode. A network technology that dynamically allocates bandwidth. ATM uses fixed-size data packets and a fixed channel between two points for data transfer. ATM was designed to support multiple services such as voice, graphics, data, and full-motion video. It allows service providers to dynamically assign bandwidth to individual customers.
ATPC	Automatic Transmit Power Control
AU	Access Unit
AVU	Air Ventilation Unit
BPSK	Binary Phase-Shift Keying. A data transfer technique. BPSK transmits data using two phase modulation signals, one phase representing a binary one, and the other representing a binary zero. The signal is divided into bits; their status is determined by the preceding wave. If the wave changes, for example, the signal is reversed.
BST	Base Station
BWA	Broadband Wireless Access
cPCI	Compact Peripheral Component Interface. A new standard for computer backplane architecture and peripheral integration, defined and developed by the peripheral component interconnect (PCI) industrial computers manufacturers group (PICMG). Designed to provide rugged, high-density systems.

CPE	Customer Premise Equipment. Communications equipment that resides on the customer's premises.
CSMA/CD	Carrier Sense Multiple Access with Collision Detection. Media-access mechanisms wherein devices ready to transmit data first check the channel for a carrier. If no carrier is sensed for a specific period of time, a device can transmit. If two devices transmit at once, a collision occurs and is detected by all colliding devices. This collision subsequently delays retransmissions from those devices for some random length of time. Ethernet and IEEE 802.3 use CSMA/CD access.
EGB	Earth Grounding Bar
EMC	Electro-Magnetic Compatibility. The capability of equipment or systems to be used in their intended environment within designed efficiency levels without causing or receiving degradation due to unintentional EMI (Electro Magnetic Interference). EMC generally encompasses all of the electromagnetic disciplines.
ETSI	European Telecommunications Standards Institute. A non-profit organization producing voluntary telecommunications standards used throughout Europe, some of which have been adopted by the EC as the technical base for Directives or Regulations.
FDD	Frequency Division Duplex. Full duplex operation by using a pair of frequencies, one for transmission and one for reception.
FEC	Forward Error Correction. A method of communicating data that can corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.
FFT	Fast Fourier Transform. An algorithm for converting data from the time domain to the frequency domain; often used in signal processing.
FTP	File Transfer Protocol. A protocol for exchanging files over the Internet. FTP uses the Internet's TCP/IP protocols to enable data transfer.
GPS	Global Positioning System. A system that uses satellites, receivers and software to allow users to determine their precise geographic position.
IB	In-Band
IDU	Indoor Unit

IEEE	Institute of Electrical and Electronics Engineers. IEEE (pronounced I-triple-E) is an organization composed of engineers, scientists, and students. The IEEE is best known for developing standards for the computer and electronics industry. In particular, the IEEE 802 standards for local-area networks are widely followed.
IEEE 802.16	Also known as WIMAX. A group of broadband wireless communications standards for metropolitan area networks (MANs) developed by a working group of the IEEE.
IEEE 802.3	A Local Area Network protocol suite commonly known as Ethernet. Ethernet uses Carrier Sense Multiple Access bus with Collision Detection CSMA/CD. This method allows users to share the network cable. However, only one station can use the cable at a time. A variety of physical medium dependent protocols are supported.
IF	Intermediate Frequency. Radio communications systems modulate a carrier frequency with a baseband signal in order to achieve radio transmission. In many cases, the carrier is not modulated directly. Instead, a lower IF signal is modulated and processed. At a later circuit stage, the IF signal is converted up to the transmission frequency band.
IP	Internet Protocol. The standard that defines how data is transmitted over the Internet. IP bundles data, including e-mail, faxes, voice calls and messages, and other types, into "packets", in order to transmit it over public and private networks.
LED	Light Emitting Diode
LPS	Lightning Protection System.
μBST	Micro Base Station
MAC	Media Access Control. The lower of the two sub-layers of the data link layer defined by the IEEE. The MAC sub-layer handles access to shared media, such as whether token passing or contention will be used.
MAC Address	Standardized data link layer address that is required for every port or device that connects to a LAN. Other devices in the network use these addresses to locate specific ports in the network and to create and update routing tables and data structures. MAC addresses are 6bytes long and are controlled by the IEEE.
MAN	Metropolitan Area Network. A data network designed for a town or city. In terms of geographic breadth, MANs are larger than local-area networks (LANs), but smaller than wide-area networks (WANs).

MIB	Management Information Base. A database of objects that can be monitored by a network management system. SNMP uses standardized MIB formats that allow any SNMP tools to monitor any device defined by a MIB.
MIR	Maximum Information Rate. Specifies the maximum rate of information that can be available to a user. The MIR is used by the traffic policing mechanism to prevent users from sending excess traffic to the network.
NIU	Network Interface Unit
NMS	Network Management System. A system responsible for managing at least part of a network. An NMS is generally a reasonably powerful and well-equipped computer, such as an engineering workstation. NMSs communicate with agents to help keep track of network statistics and resources.
NOC	Network Operations Center. The physical space from which a typically large telecommunications network is managed, monitored and supervised.
NPU	Network Processing Unit
OA&M	Operation, Administration & Maintenance. Provides the facilities and the personnel required to manage a network.
ODU	Outdoor Unit
OFDM	Orthogonal Frequency Division Multiplexing: A method for multiplexing signals, which divides the available bandwidth into a series of frequencies known as tones. Orthogonal tones do not interfere with each other when the peak of one tone corresponds with the null. The rapid switching, frequency-hopping technique is intended to allow more robust data service.
OOB	Out-Of-Band
PER	Packet Error Rate. In a digital transmission, PER is the percentage of packets with errors divided by the total number of packets that have been transmitted, received or processed over a given time period.
PIU	Power Interface Unit
PSU	Power Supply Unit

PPPoE	Point-to-Point Protocol over Ethernet. PPPoE relies on two widely accepted standards: PPP and Ethernet. PPPoE is a specification for connecting the users on an Ethernet to the Internet through a common broadband medium, such as a single DSL line, wireless device or cable modem. All the users over the Ethernet share a common connection, so the Ethernet principles supporting multiple users in a LAN combines with the principles of PPP, which apply to serial connections.
QAM	Quadrature Amplitude Modulation. A technique used in wireless applications to double the available bandwidth by combining two amplitude-modulated signals. The two combined signals differ in phase by 90 degrees; this technique doubles the bandwidth by combining the two signals at the source before transmission, transmitting digital data at a rate of 4 bits per signal change.
QPSK	Quadrature Phase Shift Keying. A data transfer technique used in coaxial cable networks that sends data using modulating signals. Four different phases represent data, with each signal's information determined by the signal before it. For example, if a phase stays the same from one signal to the other, the information has not changed.
RF	Radio frequency. An AC signal of high enough frequency to be used for wireless communications.
Rx	Receive
SME	Small and Medium-sized Enterprises. SMEs are small-scale entrepreneurial private enterprises: they are usually defined as having less than 250 employees, but most have far fewer.
SNMP	Simple Network Management Protocol. A network management protocol that provides a means to monitor and control network devices, and to manage configurations, statistics collection, performance, and security. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network. SNMP-compliant devices, called agents, store data about themselves in Management Information Bases (MIBs) and return this data to the SNMP requesters.
SOHO	Small Office Home Office. A term that refers to the small or home office environment and the business culture that surrounds it. Typically it refers to an office or business with ten or fewer computers and/or employees.
SU	Subscriber Unit

TCP	Transmission Control Protocol. Connection-oriented transport layer protocol that provides reliable full-duplex data transmission. TCP is the part of the TCP/IP suite of protocols that is responsible for forming data connections between nodes that are reliable, as opposed to IP, which is connectionless and unreliable.
TCP/IP	Transmission Control Protocol/Internet Protocol. A set of protocols developed by the U.S. Department of Defense to allow communication between dissimilar networks and systems over long distances. TCP/IP is the de facto standard for data transmission over networks, including the Internet.
TFTP	Trivial File Transfer Protocol. Simplified version of FTP that allows files to be transferred from one computer to another over a network, usually without the use of client authentication.
Tx	Transmit
U	A unit for measuring the height in rack cabinets. 1U = 1.75 inches.
WAN	Wide Area Network. A computer network that spans a relatively large geographical area. Wide area networks can be made up of interconnected smaller networks spread throughout a building, a state, or the entire globe.